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TELL THE INVESTORS THE FACTS!

Texans have a reputation for willingness both to speak and to act with force and vigor when occasion requires. The Independent telephone men of Texas nobly upheld that reputation when, on March 18, the Texas Independent Telephone Association officially took cognizance of speculative promotional activities being carried on in the Independent telephone industry and, in a strong resolution unanimously adopted, expressed the opinion of that association on such activities in no uncertain terms.

The Texas telephone men, in drafting and adopting their resolution, no doubt had memories of those gray days in the history of Independent telephony in their state, some 15 years or so ago.

* * * *

Promoters and "high-financiers" had descended upon the state and had promoted numerous Independent telephone companies with inflated capitalizations and issued bonds against such companies "ad infinitum." They sold the bonds and most of the stock to an unsuspecting public and departed with their profits, leaving local managements and the investing public to hold the bag.

Within a few years many of these companies were bankrupt, their bonds in default, their stock practically valueless; the investments of the bondholders and stockholders had melted away, and the industry and its securities were without honor or credit in that part of the country.

* * * *

No doubt these telephone men were remembering those long years of operating and financial difficulties required to laboriously build the business back from such a condition of financial demoralization to the splendid position of efficiency and credit it enjoys in the Southwest today. The resolution which they adopted indicates that they are determined to resist to the limit every activity by a fresh crop of promoters to repeat in their section of the country the financial debacle through which so much of the industry there passed two decades or so ago.

The Texas association, in its resolution, has stated its case clearly and characteristically. And since its situation is about on a parity with that in every state in the Union in which there exist Independent telephone companies of any size or consequence, it will be of interest to the entire telephone industry—and also to the interest of the investing public—to consider it at length.

* * * *

This is what the Texas Independent Telephone Association said in its resolution of March 18th about the situation prevailing in the Independent telephone field today:

"Whereas, promoters are active in many of the states in the Union in acquiring Independent telephone properties and issuing and selling bonds and other securities against such properties, and

Whereas, the bonds and other securities being issued and sold to the investing public by such promoters are, in many cases, issued against inflated valuations of such properties and without due provision for all the necessary operating and other expenses to properly maintain and operate the property so as to render adequate service to the public, and particularly without adequate provision against the inevitable depreciation of such properties, and

Whereas, such bonds and other securities so issued are, therefore, not in keeping with the safe and conservative financing policy that is a characteristic of the telephone industry."

This states the case, but Texas is not content with merely stating the case—it proposes to do something about it. And that something is also characteristic of the vigor and determination of the citizen of the Lone Star State when he is aroused.

* * * *

Texas proposes to take the most direct and effective route to cure the trouble; that route being to carry the facts about the situation directly to the investors who are furnishing the money with which the promoters operate. The resolution continues:

"Now, Therefore, Be it Resolved:

First, that under such circumstances it is the duty of this association, for the protection both of the investing public and of the financial stability of the telephone industry in this state, not only to take note of these conditions, but to call them to the attention of the investing public, and

Second, that it be pointed out to the investing public that in many cases the earnings of the telephone company, applicable to the payment of interest on bonds or dividends on stock issued and offered to the public by such promoters, are shown in the statements given out by such promoters without due regard for adequate

depreciation on the property securing such bonds or stock, and

Third, that the prospective investor is cautioned to examine such security offering closely with respect to this item of depreciation and to give particular and cautious scrutiny to circulars and advertisements offering telephone securities for sale on which:

(a) The amount allowed in the expenses of the company for depreciation of the property is not clearly stated, or

(b) The amount allowed in the expenses of the company for depreciation of the property is calculated at less than the rate of depreciation that long years of experience in the telephone business have proved to be necessary for the protection and perpetuation of the property against obsolescence, inadequacy and wear."

The Texas association has placed its finger directly upon the "bug under the chip"—depreciation!

* * * *

Every telephone man knows that it is possible to take practically any telephone property and make, on paper, a financial and earnings showing for it sufficient to justify apparently the issuance of an excess of investment securities against it, provided one is willing to overlook or to minimize the importance of certain fundamentals of the business. One of those fundamentals is depreciation.

Knowing this, and recognizing that the average investor does not realize the importance, from a standpoint of continued earnings, of not only depreciation but the *rate* of depreciation provided for in the expenses of the company, the Texas association proceeds in its resolution to give the investor some practical information on the subject. The resolution continues:

"Fourth, that for the information of the investor it be pointed out that experience has proved that an annual charge of around 5 per cent or more of the cost of reproducing the property is necessary to adequately provide for depreciation expense (and that around 6 per cent is considered necessary for small telephone plants); and that the investor can readily ascertain whether or not adequate provision has been made for depreciation by taking that amount stated as the cost of reproducing the telephone property new and calculating depreciation thereon at around 5 per cent or more and including the figure thus arrived at in the annual expenses of the company and thereby ascertaining what amount is remaining after depreciation as actually available for other expenses, taxes, and for bond interest, dividends and surplus earnings."

The Texas association is, we think, entitled to the thanks of the entire telephone fraternity for having ably summed up the whole subject in a minimum of words.

* * * *

Experience—actual operating experience of telephone companies, large and small, throughout the country, over many years—has proved that this question of depreciation is no academic matter; that, unless an adequate reserve for depreciation (which term in the industry includes also obsolescence and inadequacy) is built up on the books of the company out of earnings, sooner or later the company and the investors therein come to grief.

Regardless of the efficiency of and expenditures upon current maintenance, no part of any telephone plant now existing is likely to either last forever, or to be adequate forever, or to be forever in keeping with the advancement of the art. At some time in the future practically every part of every telephone plant now in existence must, for one of those reasons or another, be replaced.

If the reserve for depreciation is not adequate to absorb such major replacements when they are made, they must come out of current earnings; when they do, there may be no earnings that year or for a number of years, remaining for dividends; perhaps none for bond interest.

Then somebody suffers—and it is usually the investor who holds the securities of the company.

* * * *

Decay, obsolescence, inadequacy—they are as inevitable as death and taxes; as certain a part of the cost of making telephone service as the payroll.

Promoters may ignore them, and optimistic engineers minimize them, to make glowing statements of net earnings upon which to sell securities and make quick profits for themselves and their backers, but telephone property continues to wear out and to become obsolete and inadequate just the same.

Time, nature, the elements and the inventive progress of the art are not under the promoter's control.

Perhaps the promoter can afford to risk his time and effort, since the investor, ignorant of the real situation, is risking the money—but the conservative telephone man, interested in the business as a business and not as a vehicle for financing profits, cannot afford to take a chance. He provides properly for depreciation.

Experienced, conservative telephone men, anxious to uphold the credit and integrity of the industry, look with amazement at some of the telephone securities recently issued and sold.

They wonder at the optimism of promoters who, after buying a telephone plant valued by operating telephone engineers at around $100,000 and then claiming a value for it of more than four times that amount and selling bonds against it in excess of the amount they paid for it, expect it to earn interest and dividends upon the capitalization absorbed by the public.

They are amazed to see securities issued against a telephone property valued by the engineers of its purchasers at more than $3,000,000, on a basis providing less than $60,000 annually for depreciation, when they note that if even 4½ per cent on the stated depreciated value of the property is allowed for depreciation, the company, according to its own published statements of earnings, is not actually earning the interest on the bonds it is selling.

* * * *

They wonder at statements printed in circulars advertising telephone securities to the effect that net earnings available for interest are several times the annual interest requirements, when apparently no provision whatever is made for depreciation, and certainly not what experience in the business would prove to be sufficient provision.

They wonder why investment houses, offering such securities to their clients, do not take the trouble to learn for themselves some of the very basic and most elementary facts about the telephone business.

* * * *

Texas is right! The way to protect the integrity and standing of the telephone industry is to show the investor himself how to judge telephone securities offered him.

The telephone business, conservatively financed and managed by experienced telephone people, is as safe and sound as any business existing. The securities of such companies stand high; deservedly so. The way to maintain them in that position is to give the prospective investor, himself, the facts about the situation.

That, it seems to TELEPHONY, is the first order of business before telephone associations and telephone men.

Fault Testing in Rural Exchanges

Testing For Faults On Rural and Exchange Lines and the Improvements Made Thereby—Practical Methods of Successful Small Exchange Maintenance—Address at Annual Convention of Minnesota Telephone Association

By A. L. Erickson,

Secretary and Manager, Hector Telephone Co., Hector, Minn.

Benjamin Franklin made this statement: "How few there are who have courage enough to own their own faults, or resolution enough to mend them." Benjamin Franklin was not a telephone man and knew nothing about the telephone business. This little quotation, however, does carry a thought that we may well apply not only to ourselves as individuals but to the telephone companies which we represent.

Were it not for faults, telephone service would at all times be 100 per cent perfect. But faults are bound to creep into our methods; or, even if our methods are beyond reproach, equipment or operatiing practices that yesterday seemed perfect may tomorrow be found wanting, Fig. 1.

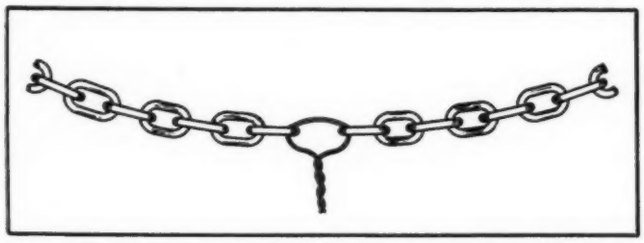
In order that telephone service be kept up to as high a standard as possible and that we may give a dollar's worth of service for every dollar we collect from the public, it is absolutely necessary that we, who are engaged in the telephone business, remedy these faults wherever they may appear.

Faulty methods in accounting must be corrected in order to give both subscriber and stockholder what each is justly entitled to. Faulty methods in the handling of traffic must be eliminated and operating practices must be changed from time to time, when faults are discovered. Faulty construction and equipment must be replaced or repaired in such a way that service is not interrupted.

Keeping the lines and circuits of an exchange free from trouble or faults is one of the most important problems before us telephone men. And when we consider that the transmission of speech, Fig. 2, over our lines is no better than the poorest joint in such lines, then first do we realize the importance not only of being constantly on the lookout for faults, but of being equipped with such testing apparatus as may be necessary for prompt and intelligent location of all trouble.

Testing for faults will be discussed, not from the standpoint of a technical man, but based on observations made while operating a small telephone plant. Inasmuch as the possibility of transmitting speech over a wire is responsible for the entire telephone business as we have it today, and the degree of perfection with which this transmission of speech is accomplished practically spells success or failure to every telephone man, it is hoped that this paper may contain something of interest to every one, but more especially to the man operating the small exchange.

Faults which interfere with transmission and signaling may well be divided into two classes—those that load up a line, (Fig. 3-*A*), and cause part or all of the electrical energy sent out to be absorbed; and those that add additional resistance, (Fig. 3-*B*), to a line, thus preventing the electrical energy sent out from reaching its destination.



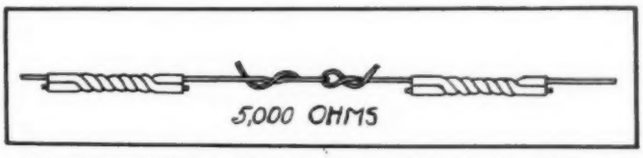


Fig. 1. "A Chain Is No Stronger Than Its Weakest Link."—Fig. 2. "The Transmission of Speech Over Our Lines Is No Better Than the Poorest Joint in Those Lines."

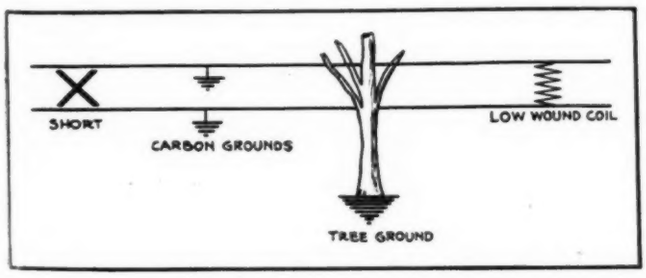
Among those, Fig. 4, which load up a line are shorts, carbon grounds, tree grounds, low-wound coils, etc.; among those which add resistance to a line are opens, high-resistance joints in line wire, bad grounds, rusty wire, poor connection between line and drops, etc.

These different kinds of faults may again be grouped and re-divided into two classes, Fig. 5, with regard to the way they behave and affect the service. For convenience sake, we shall name them, acute and chronic.

Among the acute troubles, we find shorts, grounds, opens, and any other trouble that will put a line out of order, and demand the immediate attention of a troubleman. Such trouble causes considerable annoyance at the time it occurs; and if trouble is not cleared promptly, we usually get repeat orders until it is taken care of.

In the chronic class, we place such faults as carbon grounds, tree grounds, low-wound coils, swinging shorts, high-resistance joints in line, poor connections, rusty wire, etc. Faults of this nature will not put a line completely out of order but they will give us unbalanced circuits, which will pick up cross-talk and power-line interference; signaling will be unsatisfactory and transmission will be way below standard.

These are really the most serious faults



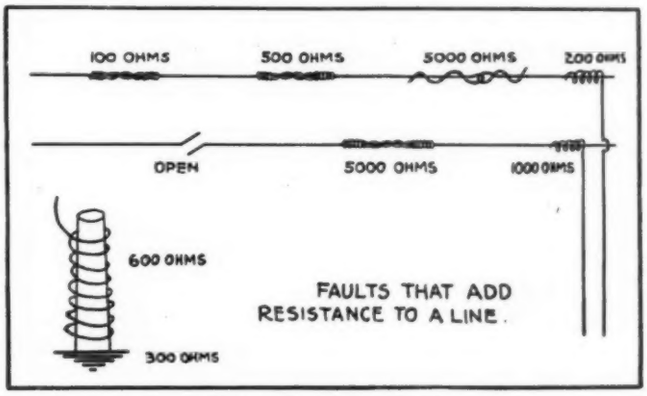


Fig. 3–A. Some Faults That Load a Line.—Fig. 3–B. Some Faults That Add Resistance to Line.

with which we have to contend. They creep in unnoticed and frequently reduce transmission more than 50 per cent before they are even called to the attention of a wire chief or troubleman, and in many cases are allowed to remain for weeks, months or even years before they are cleared.

Some may say that such conditions only exist in small exchanges that are not properly supervised. I have in mind at the present time a case of trouble, which actually existed on a toll line of one of the large companies, that cut down the transmission way below 50 per cent. It was allowed to remain for more than a year before the high-resistance joint that caused the trouble was finally located; this despite the fact that this line was being patroled constantly and was under the supervision of a wire chief. This case came to my observation several years ago.

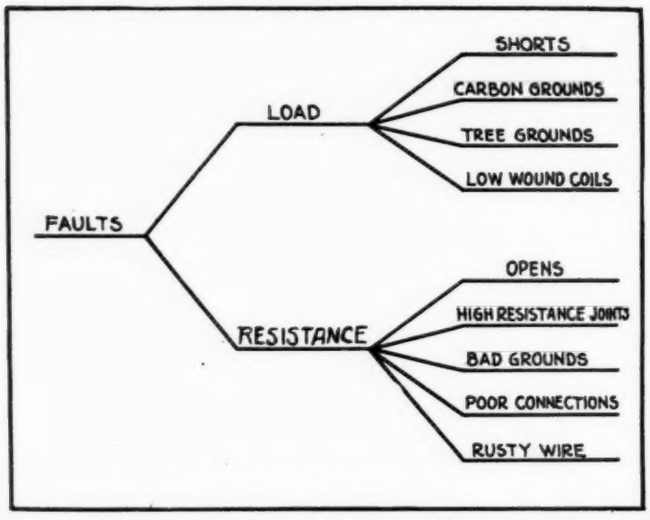
You have often heard some one, in trying to talk over the telephone, tell the party at the other end that he sounds as if he were in China. You may laugh at this expression, but the originator possibly knew more than we give him credit for. The lines, Fig. 6, that we try to talk over to a person five or ten miles away are often equal to several hundred miles of iron wire. It is, therefore, not at all surprising that we can not always hear well when conversing.

New batteries and good transmitters are very necessary to good transmission, but let me say this: The speech will not get far if we do not provide and maintain suitable channels over which it may travel. Such channels or lines, in order to talk up 100 per cent perfect or nearly so, must be free from trouble, not only of the kind that puts them out of order but also of the kind that hinders transmission in various degrees.

In order to remedy these faults from time to time, and especially to keep those of the chronic nature from developing to any great extent, it is necessary that we be equipped with some sort of testing apparatus. Testing equipment, if properly used will do for the telephone company exactly what the stethoscope and X-ray do for the doctor. Inexpensive testing apparatus answers the purpose very nicely the small exchange. A simple voltmeter and a direction set in the hands of the average telephone man will locate far more trouble than would a bridge costing several hundred dollars. A voltmeter connected to a plug on the switchboard will tell in a jiffy whether or not a line is normal. In the case of rural lines that are of various lengths and which do not all carry the same number of telephones, it is somewhat of a job to figure out exactly what the normal reading should be.

It might, therefore, be a good idea to record the normal reading of such lines. A slight variation from this normal reading will indicate that something is wrong and that the subscribers on this line are not getting full value for their money, although they are able to use their telephones and are accepting the service such as it is. Many whom we brand as chronic kickers are perfectly justified in their complaints and it is we who are to blame when we refuse to listen when they repeatedly call our attention to some little defect to which we do not like to own up.

If the voltmeter reading shows the resistance below normal, this line has acquired some extra load; while if it shows the resistance above normal, it indicates that the line has acquired additional resistance. In either case the standard of



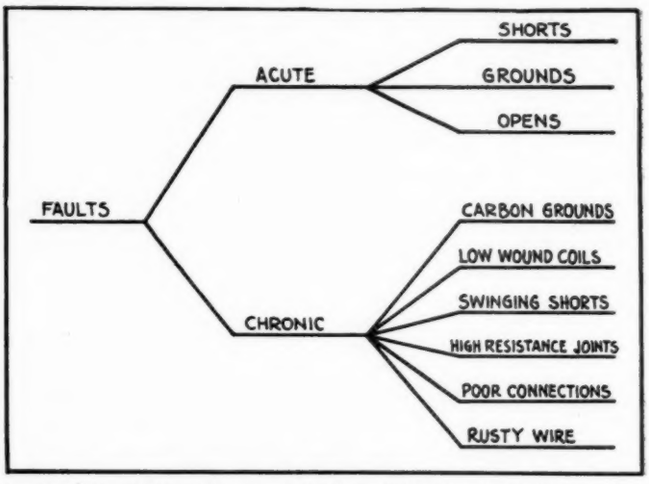
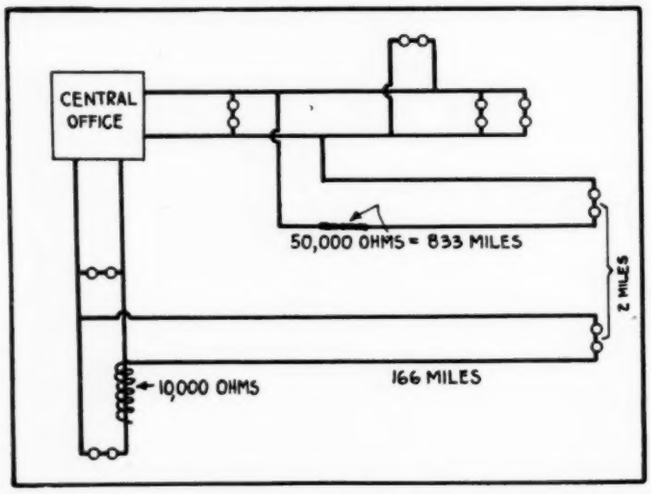


Fig. 4. The Two Classes of Faults Which Interfere with Transmission and Signalling.—Fig. 5. Grouping of Faults According to the Way They Behave and Affect the Service.



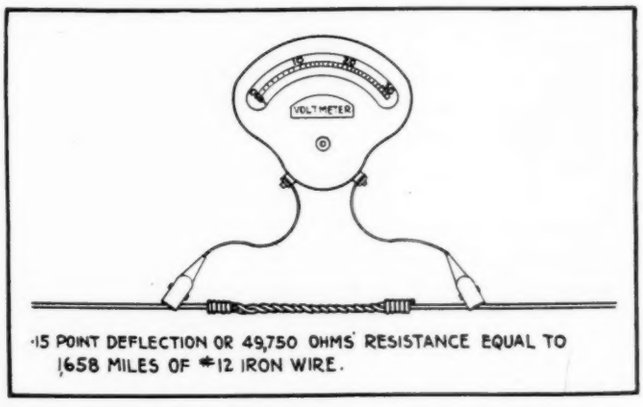


Fig. 6. "Lines That We Try to Talk Over to Persons Five or Ten Miles Away Are Often Equal to Several Hundred Miles of Iron Wire."—Fig. 7. "We Have Found Several High-Resistance Joints Equal to 800 Miles of Metallic Line.

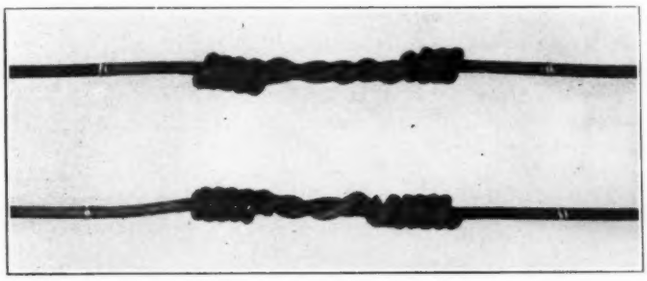


Fig. 8. Top Joint (Above) Had 800 Ohms Resistance; Lower Joint, 120 Ohms.

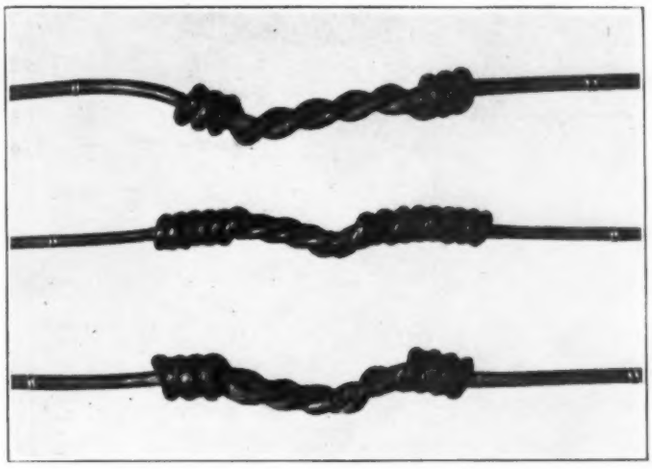


Fig. 9. Top Joint (Above to Right) Measured 10,000 Ohms' Resistance, a Poor Connection; Middle Joint, 1,500 Ohms; and Lower Joint, Another Poor Connection, 5,000 Ohms.

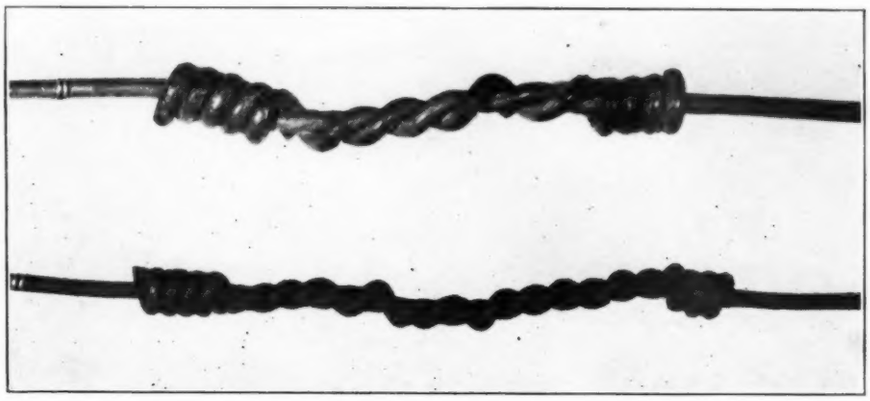


Fig. 10. Iron Wire Joints: Top, 125 Ohms' Resistance; Bottom, 210 Ohms.

service which we are giving has been reduced. If we get in the habit of remedying these faults before the subscribers even know there is anything wrong, there will be at least one factor eliminated from our next rate case, namely poor service.

In cases of long, heavily-loaded rural lines the faults cannot always be read satisfactorily with the voltmeter at the office, and a portable voltmeter and direction set used in this connection will save enough livery to pay for itself in a surprisingly short time. In our case we have used a cable tester as a direction set with very good results. With this we have been able to locate some very light shorts, and some that were very obstinate and difficult because of their being intermittent.

In one particular case of a light, intermittent short on a rural line that had been annoying us for a considerable length of time, several trips had been made to clear it, a distance of 12 miles from town, and each one was unsuccessful.

By using a cable tester as a direction set, we were able to locate the trouble in about an hour's time. The short was found in the insulation between the contact springs on a generator and, although it acted as a drag on the entire line, we had been unable to locate it because of its nature. We had visited the telephone several times but had never been able to ring the trouble on sufficiently to detect it.

After having had considerable trouble

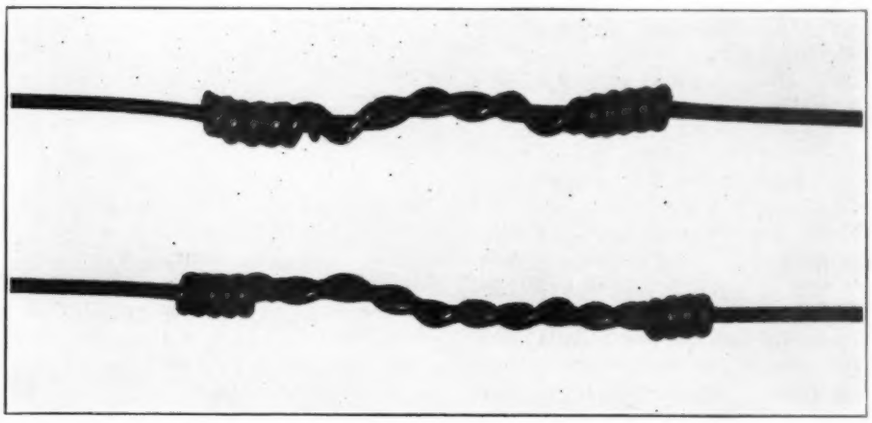


Fig. 11. Rusty Iron Wire Joints: Top, 650 Ohms' Resistance; Bottom, 225 Ohms.

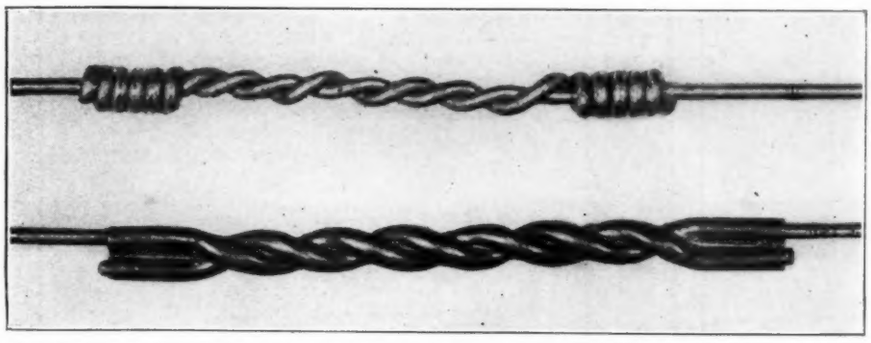


Fig. 12. New Iron Wire Joints: Top, O. K. While New; Bottom Joint Using Sleeve Connector Gives Zero Reading at All Times.

with poor transmission on rural lines we began checking them for high-resistance joints. Certain telephones on our exchange that used to talk up well seemed to become fainter and fainter until we were unable to hear them at all. Battery renewal seemed to revive these telephones at least partly but only for a time.

In checking these out with a voltmeter, Fig. 7, we have found several high-resistance joints, some having a resistance of more than 50,000 ohms, equal to approximately 1,600 miles of No. 12 iron wire, or 800 miles of metallic line. Several of these joints are shown in Figs. 8-12. These

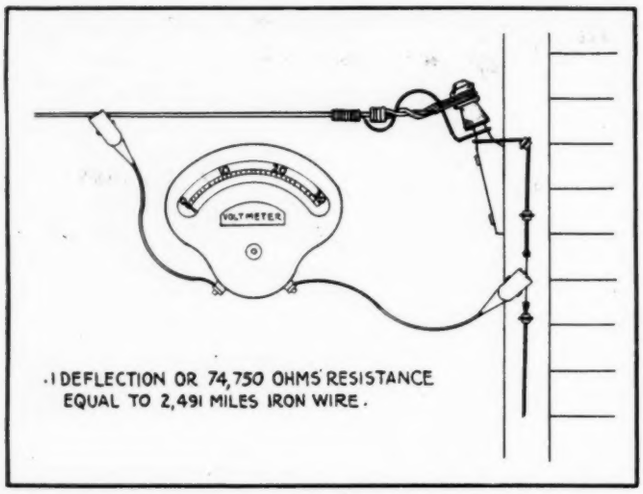


Fig. 13. Joint Through Which Telephone Had Practically No Connection With Main Line, Except When New Batteries Were Installed.

joints were tested with a voltmeter using a low voltage. Application of a high voltage would break down resistance and the test would be of little or no value.

Most of these joints were found in branch lines leading up to houses; one of the samples was found where the house wire was connected to line. This particular case had given us trouble for several years, but seemed to clear up pretty well every time we put in new batteries, because of the fact that the stronger current from the new batteries would break down the high resistance, even to the extent of keeping the line open for other weaker signals.

In checking this trouble with a portable voltmeter, Fig. 13, it was found that this telephone had practically no connection with the main line; the resistance found in the joint was 74,750 ohms, or equal to 2,491 miles of iron wire size No. 12, figuring 30 ohms to the mile. In arriving at this resistance, we are assuming that the voltmeter shown in the diagram has an internal resistance of 250 ohms and a short reading of 30 points.

We have checked some of the rods on our grounded lines and have found some to have considerable resistance to ground. A rod which is under suspicion can easily be replaced with a new one. This is the usual procedure, for a ground rod does not submit to test as readily as do joints in wire, Fig. 14, where we can get at them from both ends.

In order to get at a ground rod from both ends, so to speak, we must use a second ground and, as we then introduce another unknown quantity, it leaves our test somewhat unsatisfactory. However, should a test of this kind be desired, it can be taken after driving a new rod near the old; but, even if it is fairly accurate, it is simply a post mortem of the old rod.

If the ground is not too hard, a fairly satisfactory test can be made without sacrificing a new rod. Two rods may be driven part way down, just far enough to encounter moist ground, and a reading taken between each two of the three rods, Fig. 15. Then, by applying the following

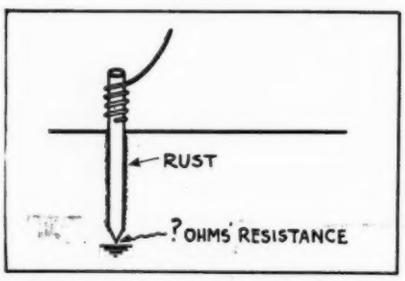


Fig. 14. A Well-Insulated Ground Rod.

formula, we find the exact resistance to ground of the old rod:

Subtract the reading taken between test rods from the sum of the other two and divide the remainder by two. In case a low voltage voltmeter is used, it may be necessary, on account of the difference in potential between old and new rods, to reverse the polarity of the meter each time and take the average of the two deflections as the correct voltage reading between the two rods.

It might be well to mention a few things in regard to the selection of a voltmeter for testing purposes. We have found that in a portable voltmeter for checking high resistance joints, etc., a low voltage meter works very well, for it does not break down the resistance when the battery is applied, and gives one a picture of the true condition that is present in such a joint when a weak voice current tries to pass.

In testing for shorts, grounds, leakage, etc., and in testing on long lines, a meter of higher voltage is better, for in this case we aim to break down and show up those faults to their fullest extent. Some voltmeters are equipped with a special scale for a direct reading of resistance. Others are equipped only with a straight voltmeter scale and the resistance can be determined by consulting a table furnished by the manufacturer. If such a table is not available, the resistance, Fig. 16, may be computed as follows:

If the voltmeter is used without a shunt, simply divide the testing voltage by the deflection of the meter, multiply this by the internal resistance of the meter and then subtract the internal resistance. This will give the resistance in ohms.

In conclusion, I wish to call attention to the great improvement in transmission which may be brought about by the elimination of such faults as high-resistance joints, partial shorts and light grounds which have crept into our circuits so gradually that we are hardly aware of their presence. It is good economy to be equipped with sufficient testing apparatus so that all cases of trouble, whether chronic or acute, be located promptly and all unnecessary driving eliminated.

Let me also suggest that testing and testing apparatus be used not merely as a short cut to locating trouble but to locate faults that would otherwise be overlooked. Let us now discard the old formula of "Fixing all we can find and letting the rest go," and adopt in its place as our motto for 1927: "Find all the trouble—and then fix all we find." That's service!

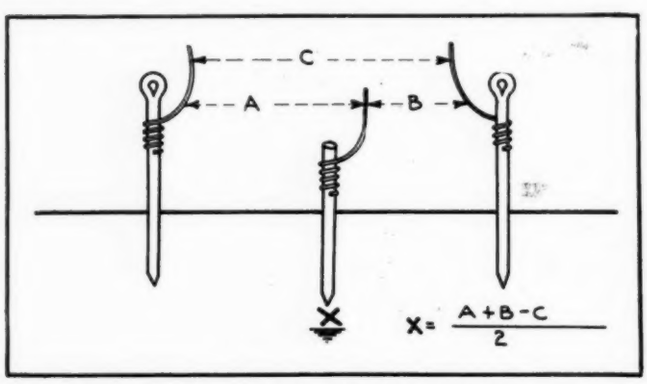


Fig. 15. Method of Testing Resistance Between Ground and Ground Rod.

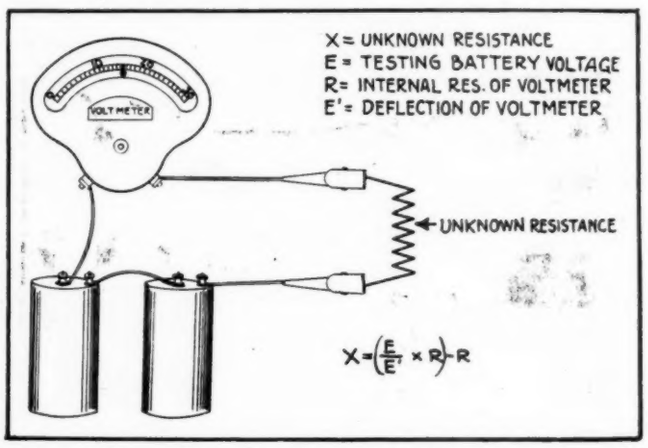


Fig. 16. Computation of Unknown Resistance In Testing With Voltmeter Without Shunt.

Keepers of the Telephone Switch

Responsibility of Employes of Small Offices in Maintaining Plant and Handling Subscribers' Complaints--Operators' Importance--Impressions Formed from Office Appearances—Paper Presented at North Dakota Convention

By Miss Anne Barnes,

Special Traffic Representative, United States Independent Telephone Association, Des Moines, Iowa.

Tending the switch at Hocum is the most important job in town; more important than the banker's job, whose nifty-looking little building down on the corner makes the rest of the business houses look gaunt, old and shabby; more important than Attorney Brown's job, whose plate glass windows say, in glittering gold words: "Stocks, Bonds, Insurance, Land," etc.; even more important than Uncle Sam's job, for he can, generally, close his Hocum post office at night, Sundays and holidays.

Why, come to think of it, this job of tending switch is more important than the job of the butcher, the baker, the doctor, the prescription filler, and the undertaker—yes, more important than the parson's job, too—because any of these men can pull up stakes, go out of business, or move out of town whenever they choose.

What would happen if the manager of the telephone company where Mary works should say to a subscriber: "We are going to close up this office soon and go out of business?"

Of course, we know that no sane manager would make such a statement, either as a joke, or under stress of great discouragement. It does not require a keen imagination to foresee what a commotion such a declaration would make: how quickly the news would spread all over the town and surrounding country.

Tending the switch at Hocum is not a one-person and a one-department job. The equipment, inside and outside of the office, may be the best on the market, but keeping it fit is what counts from the public's viewpoint. This responsibility belongs to the combination manager-lineman of the small offices.

Meeting the customer over the switchboard counter is equally important. To handle its calls for service courteously and effectively, at all hours of the day and night, is what counts from the public's viewpoint.

Billing and collecting is, as a rule, handled by the manager and the operator of Hocum centrals. The public expects to pay for the service it uses; therefore, we should be accurate in our billing statements, and prompt and business-like in our collecting practice.

We should go after the money in the spirit of having sold something to our customers of which we are proud, instead of the attitude—"I'm afraid you will order your telephone taken out if I press you too hard for the money"—so many small companies assume in collecting.

The trouble is—and it sure is trouble—the public knows so little about our business. We should acquaint it with some of the many interesting facts about this service it uses. Then it will respect, value and pay for our commodity, as it does for the food, shelter, clothing, etc., of other merchants.

"Surely," Says Miss Barnes, "The Duties of Our Operator Switchkeepers Are a Combination of Parts, and Should Be Handled by a Common Law—A Universal Standard."

We know how faithful the average telephone employe is to his trust. When the manager of the small telephone company, awaking in the night, hears a terrific storm raging, as he frequently does up in this country, he visualizes his little system of wires and poles as rocking, snapping and breaking under the strain, no matter how well-built it may be. He knows, although he cannot see out of the frost-festooned windows, that the storm blasts are leaving a trail of trouble behind them.

Is he thinking of giving up, as he lies there and listens to the storm raging and howling in fiendish frenzy as it tears limbs from trees, wire from poles? We know that such a thought has not once entered his mind; and we know that he is planning to get an early start in the morning and work as long as daylight lasts. Not only tomorrow, but many tomorrows, for that is the spirit of the telephone service.

If the lashing of the elements arouses John Drygoods, he listens drowsily for a moment, murmurs, "Business slow tomorrow," and drops off to sleep again. Charlie Groceryman murmurs something about "Telephone orders," buries his head under the bed covers, and lapses into a snoreful slumber.

When the lights begin to appear in the windows of houses all over the community, then begins much speculation as to the extent of the storm. Will there be school? Will there be street-car and train service?

Subscribers instinctively turn to their telephones. If they are able to signal Central, they call for mothers, sisters, relatives, friends, neighbors—anybody—more for pure joy of feeling they are not cut off from the world than real concern about others. But if their wire happens to be one of those festooning the side of the road, how solitary they feel! Truly, the public has grown to depend upon this service we render. Let us not under-estimate its value by any cowardly collecting method.

Residents of small towns may be content to trade in the home town's general stores, which carry stock limited in variety; but for their telephone service they want the best at all times, for both local and long distance.

The telephone man in charge of the upkeep of a Hocum telephone property has very little idle time on his hands if he keeps his lines, telephones, and office equipment in good working condition. No matter how well maintained his plant is, he must always watch for the things which may cause poor transmission. An ounce of prevention is worth a pound of trouble-hunting.

Some of the things which contributed to poor transmission are: Faulty equipment at the subscriber's station; poor maintenance of line, office wiring, and switchboard.

If a faulty connection is established at Hocum to other connections beyond our town, communication is affected accordingly, regardless of how perfect these other connections beyond may be.

I usually judge a telephone company by the condition in which I find subscribers' telephones. If the mouthpiece is chipped off, or missing, I sometimes ask: "Why don't you report to Central that the mouthpiece is broken on your telephone?" Nine

times out of ten the reply is: "Oh, we did report it but they never paid any attention. It has been broken for a year."

I believe that the condition of a subscriber's equipment may often have its effect on his state of mind about the telephone company. For instance, he is all out of sorts about some contact with a telephone representative. As he stands at his telephone and argues into an old broken mouthpiece, his respect for the company decreases to low ebb. He is likely to grow angry and unreasonable, and intimate that the company is robbing him. At any rate, we do know that transmission is affected when a subscriber is obliged to talk into a telephone which has no mouthpiece or only a part of one.

I believe that the man who is responsible for the upkeep of an exchange should make a tour of inspection over his field at least twice a year. Subscribers are sometimes slow about reporting trouble, especially if they are responsible for the breakage.

First impressions are often good indications of what one can expect. The first impression one forms of a telephone company when he comes to the office, is from the entrance way. The entrances to many Hocum central offices are via stairways directly up from the sidewalk on Main street; and some of these stairways are dirty and musty.

I do not know who is responsible for keeping these stairways and entrances swept clean. But I do know that if I were conducting a business which represented, generally, more investment than any other business in town, I would surely want its entrance way clean and inviting.

I gain another impression of a telephone compay from the condition of the operating room—the place where Mary the operator, spends one-third of her life— and from the condition of the operator's headgear, her chair, and her switchboard tools.

Visualize an operator sitting at the switchboard on an old chair which wobbles every time she moves; and now imagine her sitting on that same chair if its wobbling tendencies had been taken out when they first showed up.

The operator's tools—her cords, plugs, ringing keys, night alarm, etc.—should be kept in good working condition. So many times I find that this repair work is reserved for rainy days; and sometimes judging by the condition of the switchboard, it evidently has not rained for years in some of these towns.

No matter how ancient the switchboard, the operators' headgear, or chairs, may be, if they are kept in good working condition, I am satisfied that a company is striving to do its best.

At last we come to Mary, the operator—your companion keeper of the switch. What sort of a person is she? What is her standing in your community? Is she a properly responsible and trustworthy person—she who serves your customers, guards the secrecy of their communications, collects your rentals and tolls, and handles your investments? Does she qualify in all of these respects?

Some day you may want to get an increase in your telephone rates. Are you sure there is nothing in your organization which, at least, might make this difficult?

If Mary does qualify in all of these respects, and if she works with you instead of for you—all other things being equal—your Hocum central office must be a model small exchange. If she does not, then you cannot hope to have such a rating, no matter how you may strive to keep your equipment in good working condition.

If you are the owner of that Hocum property, it is your business to know that the service rendered by your operator is satisfactory.

If you are not the owner but are the manager, then, it seems to me, your responsibility is greater because your company is depending on your judgment in all matters pertaining to the operation of its exchange.

Mary, if it falls to your lot to work with a manager who seems to pay little attention to your part in the keeping of the switch, do not fail your subscribers in the slightest detail because of this. It may be just his way not to mention things, but be assured that he appreciates your good efforts. After all, Mary, why should he need to commend you for doing well what you should do well?

And how do you take correction, Mary? If your manager feels that it is necessary to call your attention to an error, a rule, or regulation that you had failed to observe, do you take the correction in a pleasant way? Or do you assume an injured air? Oh, I hope not, Mary.

What sort of a housekeeper are you, Mary? Do you keep your operating room neat and orderly?

I am thinking of two little Hocum centrals I visit occasionally. They are owned by the same man, and are equally well-located and equipped. But one is infinitely more desirable to spend a day in, for it is neat and clean; the other is four walls around a switchboard, plus dust and untidiness.

Webster defines order as: "System; a combination of parts; orderly arrangement according to some common law."

Surely, the duties of our operator switchkeepers are a combination of parts, and should be handled by a common law—a universal standard. We want to learn more of this system of orderly arrangement which should universally govern our service at the switch.

The service rendered by the men and women in these Hocum centrals is just as important as that rendered in Crystal City offices, for we are jointly serving one public.

All day, all night, we feel the vibration of
our switchboard loom—
We who are switchkeepers in the telephone room—
As from near and far it thrills with deep
and muffled sound.
Of voices from the world around.

Busily, ceaselessly, goes our loom
In the light of day and the midnight gloom;
The wires are humming early and late,
As messages are drawn into the warp of fate.

With smiling faces and hearts carefree,
And hands as busy as hands can be,
We sit at our switch with its warp outspread;
And catch the calls from each wire thread.

Buzz! Buzz! There's a call of love woven in;
Buzz! Buzz! There's another of wrong and sin.
Oh, what a service web we shall see,
When our work is unwound in Eternity.

When shall this wonderful web be done?
In a thousand years? Ah yes, then one.
Never mind, we'll sit at our switch—you and I—
And be weavers of speech as the years roll by.

New York City Operators to Use Phrase, "Thank You."

Within the next few weeks the New York Telephone Co. will complete the introduction in New York City of the practice of having its operators acknowledge numbers with "Thank you" instead of repeating them.

This change was made in a few offices at a time and will take about two more weeks to complete. A number of New York City offices and suburban offices generally are already following the practice, which has been put into general use throughout the country.

The new plan is used in New York City in connection with an important improvement in the method of completing calls between central offices. This method, known as "straightforward trunking," enables the calling party to hear his operator pass the number called to the distant operator. This gives the subscriber an opportunity to make a correction.

Under the old method the operator had to repeat the number and wait for the person calling to say "Right" or "Yes," or to correct her. Under the new method, she says "Thank you," thus assuring the subscriber that she understands the number correctly and has already started to make the connection.

Telephone officials say that the advantages of the new method are: It increases speed of service through eliminating much of the time consumed in repetition; it makes a quieter central office, thus enabling the operators to concentrate more fully upon the work involved in handling calls; it forms a courteous acknowledgment of the subscriber's order and tends to stimulate courtesy in telephone service generally.

Fundamental Principles of Radio

"The A. B. C. of Radio," as Presented in Addresses Before The Executives' Club of Chicago and Convention of Missouri Telephone Association--Radio Vacuum Tubes and Their Action in Receiving Set Circuits—Concluded

By Ray H. Manson,

Chief Engineer, Stromberg-Carlson Telephone Mfg. Co.

Without question, fidelity of reproduction is the most important quality of a radio receiver intended for entertainment purposes, and within reason, all other receiver features should be secondary. With this thought in mind, the important requirements of a radio receiving set listed in the order of their relative importance, are:

Desirable Qualities of a Radio Receiver.

1. Fidelity of tonal quality at the maximum volume desired by the listener.
2. Selectivity to allow for separating correctly spaced local or distant station programs.
3. Sensitivity, ample to bring in the programs from any desired distant station, when receiving conditions are favorable.
4. Simplicity of control, including the selecting of stations, regulating of volume and cutting on and off of the current supply.
5. Appearance, to adapt the receiver to the surroundings in the home.

By referring to Fig. 8, which shows a graphical comparison of the frequency range of a piano and other musical instruments, as well as that of the human voice, it will be seen that the fundamental frequencies between 24 and 4,000 should be transmitted and reproduced for best quality of radio reproduction. In fact, the harmonics (higher frequencies) are essential for obtaining the overtones that allow us to distinguish between two different types of instruments playing the same notes. This brings the upper limit to approximately 10,000 cycles.

Practical Limitations of Audio Frequency Band.

Even though amplifying systems can be

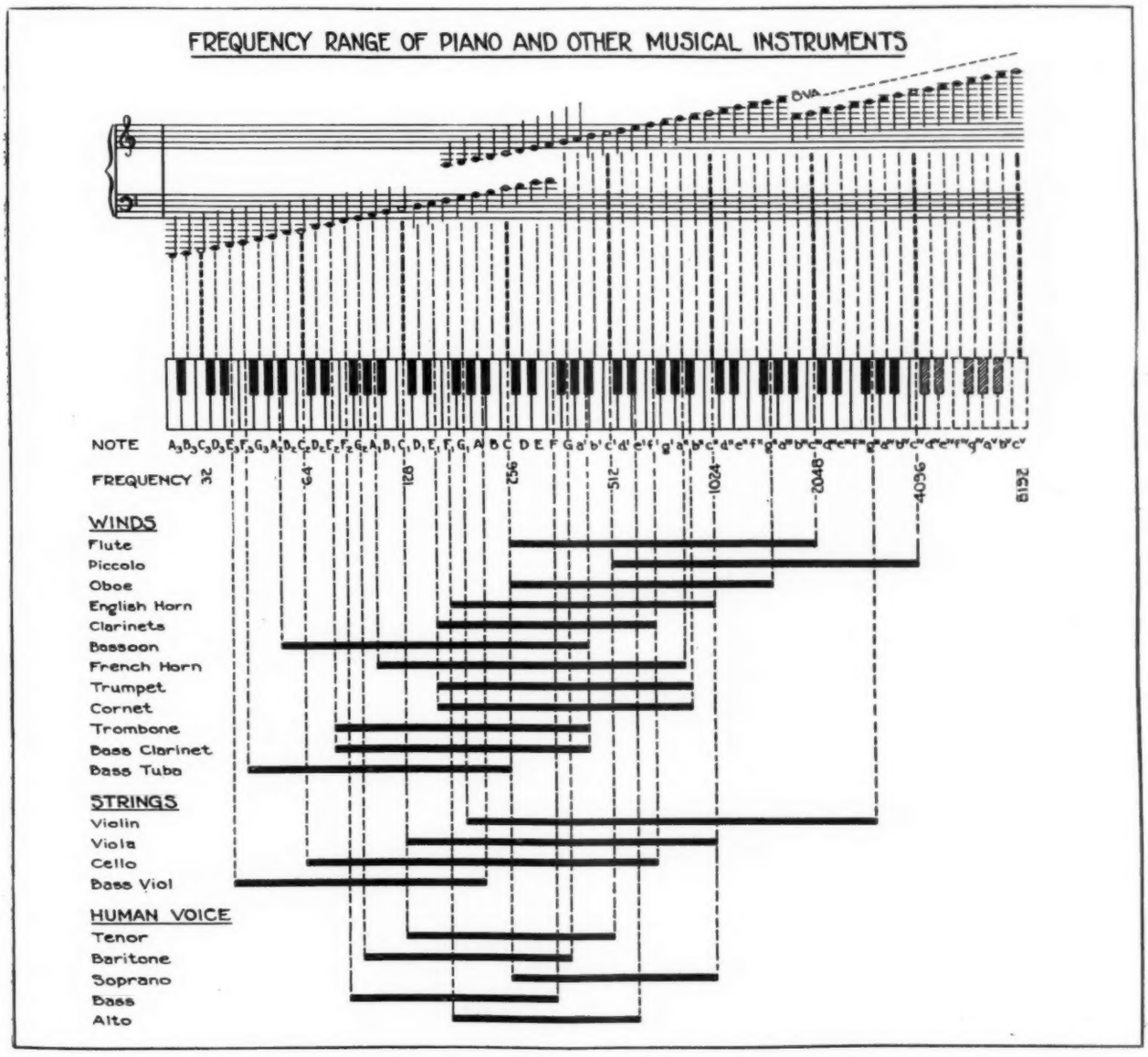


Fig. 8. Frequency Range of Piano and Other Musical Instruments.

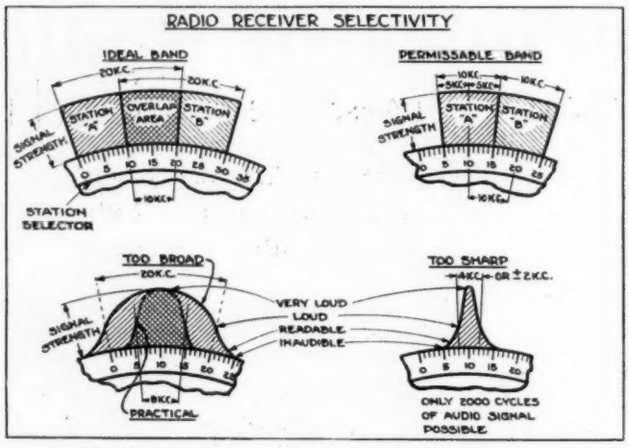


Fig. 9. Relation Selectivity and Tonal Quality.

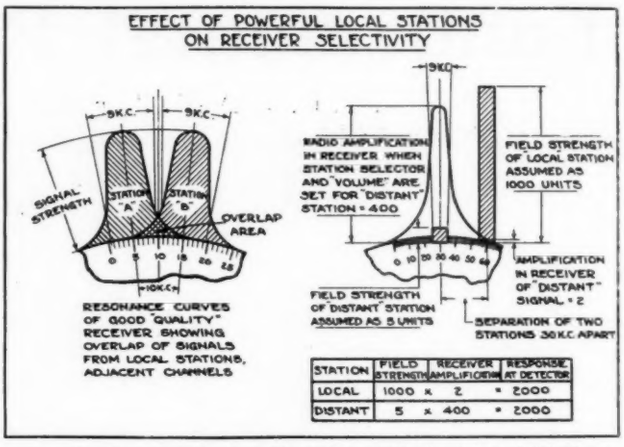

EFFECT OF POWERFUL LOCAL STATIONS ON RECEIVER SELECTIVITY
SIGNAL STRENGTH
STATION "A"
STATION "B"
OVERLAP AREA
RESONANCE CURVES OF GOOD QUALITY RECEIVER SHOWING OVERLAP OF SIGNALS FROM LOCAL STATIONS, ADJACENT CHANNELS
RADIO AMPLIFICATION IN RECEIVER WHEN STATION SELECTOR AND "VOLUME" ARE SET FOR "DISTANT" STATION = 400
FIELD STRENGTH OF LOCAL STATION ASSUMED AS 1000 UNITS
AMPLIFICATION IN RECEIVER OF "DISTANT" SIGNAL = 2
FIELD STRENGTH OF DISTANT STATION ASSUMED AS 5 UNITS
SEPARATION OF TWO STATIONS 30 K.C. APART
STATION | FIELD STRENGTH | RECEIVER AMPLIFICATION | RESPONSE AT DETECTOR
LOCAL | 1000 x 2 = 2000
DISTANT | 5 x 400 = 2000

Fig. 10. One Reason for Blanketing Effect of Local Stations.

made that will include this wide band of audible frequencies, there is a practical limitation imposed by the assignment of United States broadcasting stations to channels 10,000 cycles (10 k.c.) apart, in the attempt to accommodate the demands of present and prospective broadcasters.

If we assume that the audio frequencies desirable for best quality reproduction should include a band 10 kilocycles wide, then there would be the carrier frequency plus the 10 k.c. and the carrier frequency minus the 10 k.c., or a total band of 20 k.c. wide. However, with the station assignments in the United States only 10 k.c. apart, this ideal band of 20 k.c. would result in an overlap area of 10 k.c., as shown in the upper left hand diagram of Fig. 9.

Thus, to prevent overlap, the total width of the frequency band must not exceed 10 k.c., or a plus and minus 5 k.c. on either side of the carrier frequency, as shown in the upper right hand diagram in Fig. 9. This gives us a possible 5,000 cycles as the upper limit for our audio frequency band.

The two lower diagrams of Fig. 9 show the effect of tuning that is "too broad," that is "too sharp" and that is "practical." The lower right-hand diagram indicates the danger to quality of reproduction when the tuning is too sharp, as in this particular case, only 2,000 cycles of audio signal can be passed.

This would cut off entirely the higher fundamental notes of the violin or piccolo, as well as many most desirable overtones of the lower notes, and result in a "thin" reproduction.

From the foregoing descriptions, it is obvious that the radio receiver tuning system must admit a frequency band of about 9 or 10 k.c. for good quality. However, if we plot two of the tuning "resonance" curves of two equally distant and equally powerful broadcast stations which are on adjacent or nearby channels, there will be an overlap area as shown in the left-hand diagram of Fig. 10. This accounts for "cross-talk" sometimes heard when local broadcast stations are on channels too close together.

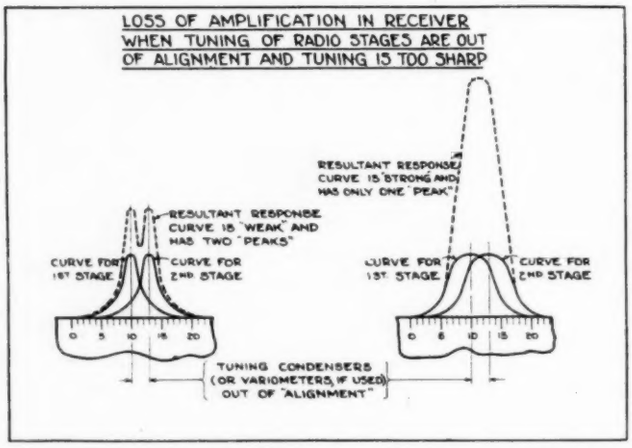
The right-hand diagram of Fig. 10 illustrates why it is difficult to get away from the signal of a powerful local broadcast station when tuning-in a weak distant station. All resonance curves have a spread at the bottom as shown, this resulting in a slight amplification for several divisions (20 or 30 k. c.) on the dial, either side of the resonance peak (point of maximum response of signal).

In this example, the field strength (signal strength at the receiving antenna) for the distant station is assumed as five units; and the radio amplification in the receiver, when the station selectors and the volume control are set for the distant station, is taken at 400 units. The product of these two factors gives a response at the detector of 2,000 units.

The powerful local station, used in this example, is 30 kilocycles away in frequency of carrier wave (three channels) from the distant station, but when the receiver is adjusted for bringing-in the distant station, the lower spread of the resonance curve gives a slight amplification of two units for the local station.

The field strength of the local station, however, is 1,000 units which when amplified by the small factor of two units of amplification, gives a response at the detector of 2,000 units. Thus, the distant and local stations both will come in with equal volume, and to the uninitiated would indicate poor selectivity.

The present trend in the mechanical design of the radio receiver is towards simplified station-selecting controls, in which several or all of the movable tuning elements are connected so as to be actuated by one or two knobs. When this is done, great mechanical and electrical accuracy must be employed to insure that the several tuning elements will "track" on each


LOSS OF AMPLIFICATION IN RECEIVER WHEN TUNING OF RADIO STAGES ARE OUT OF ALIGNMENT AND TUNING IS TOO SHARP
RESULTANT RESPONSE CURVE IS STRONG AND HAS ONLY ONE PEAK
RESULTANT RESPONSE CURVE IS WEAK AND HAS TWO PEAKS
CURVE FOR 1ST STAGE
CURVE FOR 2ND STAGE
TUNING CONDENSERS (OR VARIOMETERS, IF USED) OUT OF ALIGNMENT

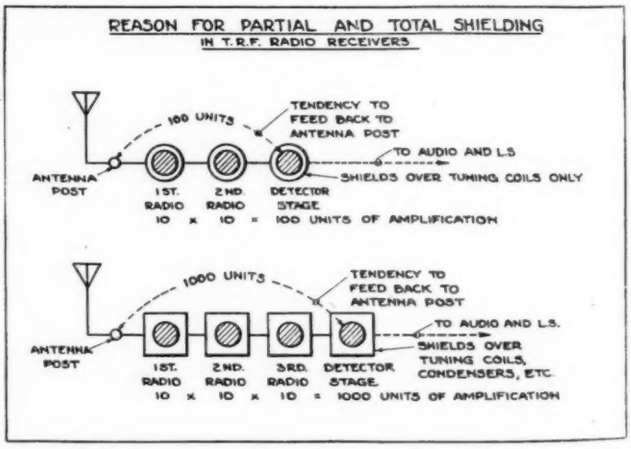

REASON FOR PARTIAL AND TOTAL SHIELDING
IN T.R.F. RADIO RECEIVERS
100 UNITS
TENDENCY TO FEED BACK TO ANTENNA POST
TO AUDIO AND L.S.
ANTENNA POST
1ST. RADIO
2ND. RADIO
DETECTOR STAGE
SHIELDS OVER TUNING COILS ONLY
10 x 10 = 100 UNITS OF AMPLIFICATION
1000 UNITS
3RD. RADIO
SHIELDS OVER TUNING COILS, CONDENSERS, ETC.
10 x 10 x 10 = 1000 UNITS OF AMPLIFICATION

Fig. 11. Losses Due to Misalignment of Tuning Stages.—Fig. 12. Reason Why Increases in Amplification Require More Complete Shielding in the Receiving Set.

tune accurately and in unison for every setting of the dial.

If the resonance or tuning curve is made too sharp and peaked at the top, low amplification and several tuning "humps" will result if the tuning elements are slightly out of alignment, as shown in the left-hand diagram of Fig. 11.

The right-hand diagram shows the same amount of misalignment, but with broad topped resonance curves. In this case there will be no great loss of amplification, although the tuning will be slightly broadened, as shown by the dotted line curve.

Another present trend in radio receiver designs of the T. R. F. types is the use of partial and total shielding over the individual tuning coils and other radio frequency apparatus. When this shielding is correctly applied, it performs several definite electrical missions: That of preventing pick-up of signals on the tuning coils, the avoiding of couplings between stages, and the overcoming of feedback from the detector to the antenna post.

In other words, shielding can be made to increase selectivity, insure best of tonal qualities, and prevent "howling" or the generation of other annoying disturbances.

The amount of shielding required by a receiver is dependent primarily on the amount of amplification provided between the antenna binding post and the detector tube. Thus, if the amplification is only 100 units, as shown in the upper diagram of Fig 12, it may be found that shields over the tuning coils only will give all of the protection required.

However, if the amplification is 1,000 units, the shielding must be more complete and usually must individually enclose each tuning coil with its associated tuning condenser, vacuum tube and all wiring for the tuning stage.

Improvements in the audio systems of radio receivers has called for many changes in the loudspeaker. Present trends are towards the open cone-type loudspeaker, due to its fine tonal qualities and to its fairly uniform distribution of sound in all directions, as illustrated in the right hand diagram of Fig. 13. The left-hand diagram shows the marked directional effect of some types of enclosed or cabinet speakers.

In the endeavor to further improve the tonal reproduction of the radio loudspeaker, it has been found that the acoustics of the room in which the speaker is placed has considerable to do with the naturalness of the results. Futhermore, the naturalness of any audio entertainment depends on the listeners facing the source from which the sound emanates.

One solution to this latter problem is to place the loud speaker as illustrated in Fig. 14; that is, beside an open fireplace, when the latter is the center of the occupants' eye attraction.

Many of the modern loudspeakers are made portable and are provided with floor pedestals or stands and long connecting cords, in order to take advantage of the principles outlined.

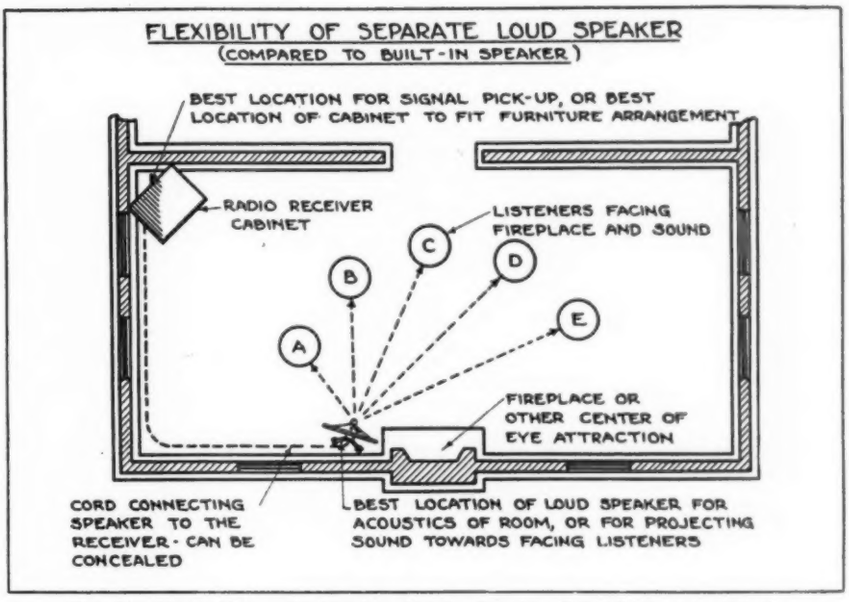

FLEXIBILITY OF SEPARATE LOUD SPEAKER
(COMPARED TO BUILT-IN SPEAKER)
BEST LOCATION FOR SIGNAL PICK-UP, OR BEST LOCATION OF CABINET TO FIT FURNITURE ARRANGEMENT
RADIO RECEIVER CABINET
LISTENERS FACING FIREPLACE AND SOUND
A
B
C
D
E
FIREPLACE OR OTHER CENTER OF EYE ATTRACTION
CORD CONNECTING SPEAKER TO THE RECEIVER - CAN BE CONCEALED
BEST LOCATION OF LOUD SPEAKER FOR ACOUSTICS OF ROOM, OR FOR PROJECTING SOUND TOWARDS FACING LISTENERS

Fig. 14. Use of Separate Loudspeaker to Provide Flexibility of Installation.

With the adoption of the floor pedestal mounted portable type of loudspeaker, some manufacturers of radio receivers have abandoned the use of a built-in speaker in the enclosed or cabinet type receiving set.

This provides a greater flexibility in the location of the receiving set to fit the best position for signal pick-up or for best location to fit the furniture arrangement of the room, and without having to consider the room acoustics or the position of the listeners. This also is shown in Fig. 14.

Long Distance Reception.

While it is conceded that the best programs, free from interference, usually are those from local stations, still there is a thrill in long distance reception that gives to radio a sporting factor that appeals to everyone owning a radio receiver. The occasional picking-up of a far distant station gives the same satisfaction to the radio fan, as the angler obtains in landing a prize fish.

It is well known that greater radio distances can be covered at night than in the

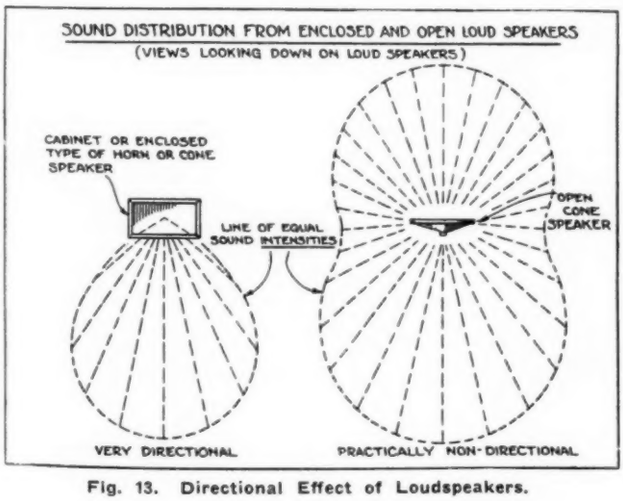

SOUND DISTRIBUTION FROM ENCLOSED AND OPEN LOUD SPEAKERS
(VIEWS LOOKING DOWN ON LOUD SPEAKERS)
CABINET OR ENCLOSED TYPE OF HORN OR CONE SPEAKER
LINE OF EQUAL SOUND INTENSITIES
OPEN CONE SPEAKER
VERY DIRECTIONAL
PRACTICALLY NON-DIRECTIONAL

Fig. 13. Directional Effect of Loudspeakers.

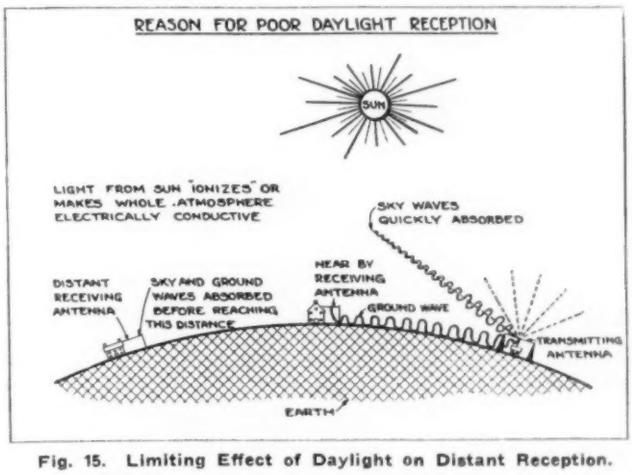

REASON FOR POOR DAYLIGHT RECEPTION
SUN
LIGHT FROM SUN "IONIZES" OR MAKES WHOLE ATMOSPHERE ELECTRICALLY CONDUCTIVE
SKY WAVES QUICKLY ABSORBED
DISTANT RECEIVING ANTENNA
SKY AND GROUND WAVES ABSORBED BEFORE REACHING THIS DISTANCE
NEAR BY RECEIVING ANTENNA
GROUND WAVE
TRANSMITTING ANTENNA
EARTH

Fig. 15. Limiting Effect of Daylight on Distant Reception.

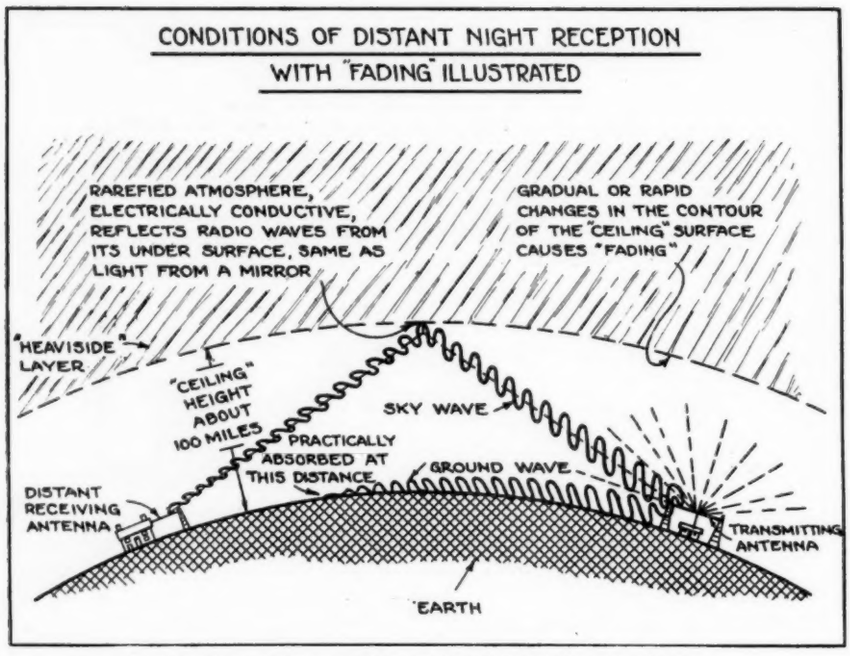

CONDITIONS OF DISTANT NIGHT RECEPTION
WITH "FADING" ILLUSTRATED
RAREFIED ATMOSPHERE, ELECTRICALLY CONDUCTIVE, REFLECTS RADIO WAVES FROM ITS UNDER SURFACE, SAME AS LIGHT FROM A MIRROR
GRADUAL OR RAPID CHANGES IN THE CONTOUR OF THE "CEILING" SURFACE CAUSES "FADING"
"HEAVISIDE" LAYER
"CEILING" HEIGHT ABOUT 100 MILES
SKY WAVE
PRACTICALLY ABSORBED AT THIS DISTANCE
GROUND WAVE
DISTANT RECEIVING ANTENNA
TRANSMITTING ANTENNA
EARTH

Fig. 16. Uncertainty of Distant Night Reception Illustrated.

day time; also that a certain amount of "fading" or periodic diminishing in the signal intensity occurs at night on distant reception. One theory for these effects is illustrated in Figs. 15 and 16.

Some of the waves from the broadcast station are considered to travel along the surface of the earth, becoming rapidly absorbed so as to entirely disappear a short distance (several hundred miles) away from the transmitting antenna.

Other waves are considered to be projected through the atmosphere, which in the daylight is "ionized" or made electrically conducting. Thus, these upper or sky waves are quickly absorbed. This condition is shown in Fig. 15 and explains poor daylight reception.

After sunset, the slight ionization of the lower atmosphere quickly disappears, but in the upper layers, about 100 miles above the earth's surface, the ionized condition continues, due to the rarity of the atmosphere and to the more complete ionization which is considered to exist there.

Waves from a broadcast station will be reflected from the lower surface of the ionized layer, just as light is reflected from a mirror. This reflected broadcast wave, in an attenuated condition, therefore, might reach a very distant receiving set antenna (Fig. 16).

The gradual or rapid changing of the contour of the under surface of this layer naturally will interfere with the steady reflection of the broadcast wave and is considered to be the cause for "fading."

It is interesting to note that this upper strata of rarefied air is known as the "Heaviside Layer" from the late Oliver Heaviside, an English scientist, who first advanced these theories.

Conditions for Best Reception.

It is well known that there are natural and man-made electrical disturbances which are similar in character to the broadcast station waves, but unfortunately are propagated on all frequencies, thus being admitted to the receiver regardless of the position of the tuning controls. These disturbances are listed under one popular heading as "static."

With this static or noise background to contend with, the clearness of a broadcast station signal is dependent on its strength as compared to the strength of the static. This is shown graphically in Fig. 17.

A weak and fading signal from a distant station will be completely submerged in the sea of static, as shown by the heavy lower line. The middle line, that cuts through some of the static, represents the signal level for a moderately distant station, while the upper line shows local reception, free from static disturbances and fading.

From these diagrams, it can be appreciated that the limit of understandable distant reception is the static or noise level encountered, and that the best reception always must come from the local or nearby powerful broadcast station. Also, this static or noise level determines the amount of useful radio amplification that can be employed to advantage in a radio receiver.

"B" Current Supply From the House Lighting Circuits.

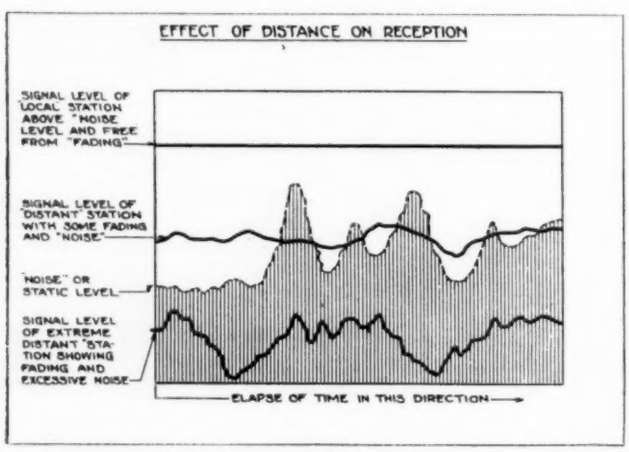
With the demands for finer tone quality, for smaller sizes of antennas and loops, and for good distance ability, the operating current requirements for the modern radio receiving set have greatly increased.

In general, the greater the demands for these features, the greater the number of tubes or the larger the tube sizes and, as a consequence, the greater the current drains.

When the current drains become excessive for the present sizes of dry-cell "B" batteries, the so-called "B" socket-power (also known as "B" battery eliminator), provides an economical supply of "B" current.

This device changes the usual 60-cycle alternating house lighting current into a direct current, free from noticeable "hum" and of the correct voltages to supply the plate current to all of the tubes in the receiver.

The principles employed in the operation of a typical "B" socket-power unit are shown by diagram in Fig. 18. The alter-


EFFECT OF DISTANCE ON RECEPTION
SIGNAL LEVEL OF LOCAL STATION ABOVE "NOISE" LEVEL AND FREE FROM "FADING"
SIGNAL LEVEL OF "DISTANT" STATION WITH SOME FADING AND "NOISE"
"NOISE" OR STATIC LEVEL
SIGNAL LEVEL OF EXTREME DISTANT "STATION SHOWING FADING AND EXCESSIVE NOISE
ELAPSE OF TIME IN THIS DIRECTION

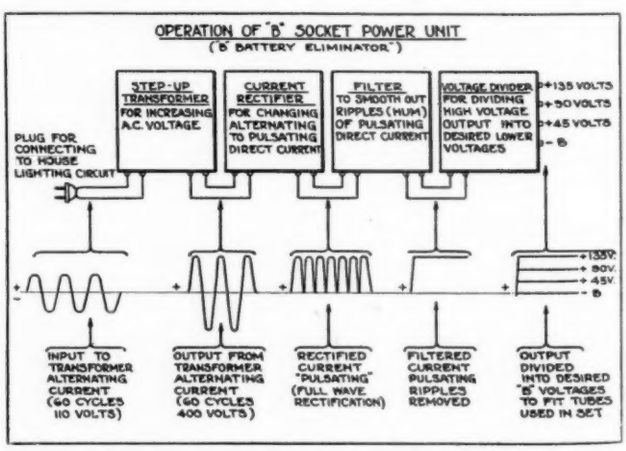

OPERATION OF "B" SOCKET POWER UNIT
("B" BATTERY ELIMINATOR)
STEP-UP TRANSFORMER FOR INCREASING A.C. VOLTAGE
CURRENT RECTIFIER FOR CHANGING ALTERNATING TO PULSATING DIRECT CURRENT
FILTER TO SMOOTH OUT RIPPLES (HUM) OF PULSATING DIRECT CURRENT
VOLTAGE DIVIDER FOR DIVIDING HIGH VOLTAGE OUTPUT INTO DESIRED LOWER VOLTAGES
+135 VOLTS
+90 VOLTS
+45 VOLTS
- B
PLUG FOR CONNECTING TO HOUSE LIGHTING CIRCUIT
INPUT TO TRANSFORMER ALTERNATING CURRENT (60 CYCLES 110 VOLTS)
OUTPUT FROM TRANSFORMER ALTERNATING CURRENT (60 CYCLES 400 VOLTS)
RECTIFIED CURRENT "PULSATING" (FULL WAVE RECTIFICATION)
FILTERED CURRENT PULSATING RIPPLES REMOVED
OUTPUT DIVIDED INTO DESIRED "B" VOLTAGES TO FIT TUBES USED IN SET

Fig. 17. The Signal Strength of Desired Station Must Be Above Static Level for Best Reception.—Fig. 18. Transformations in Changing Alternating Current to Direct Current for Operating Vacuum Tube.

nating current from the house lighting circuit, which is usually 60 cycles, 110 volts, is connected to a step-up transformer that raises the voltage to that required by the rectifying circuits, say 400 volts.

This high voltage current is passed through a rectifier which changes the alternating wave into a pulsating direct current. Then follows a filter for smoothing out the ripples (hum) of the pulsating current.

Finally, this rectified and filtered current is passed through what is known as a voltage divider, which is so designed as to give the several "B" voltages required by the particular tubes used in the receiving set.

The successful operation of these "B" socket-power units depends on meeting the exact requirements of the tubes employed in the receiving set, the best results naturally being obtained when the unit is designed and permanently adjusted in the factory for a particular model of receiver.

"A" Current Supply From the House Lighting Circuits.

There are four methods now employed to utilize the alternating current from the house lighting circuit for furnishing the "A" current supply (current for heating and tube filaments). These are listed in the order of their present popularity.

1. Storage type of "A" battery automatically recharged by what is known as a trickle charger, which takes its current supply from the house lighting circuit. No change is required in the receiver to accommodate this type of current supply.

2. The rectifying and filtering of the alternating house lighting current for the filament supply, by means of a unit similar to the "B" socket-power unit shown in Fig. 18. Requires that the radio receiver circuits be changed to place the tube filaments in series, the usual arrangement of tubes in a receiver being a multiple connection of all filaments across the "A" current supply circuit.

3. The feeding of the alternating current from the house lighting circuit, directly to a special alternating current type of vacuum tube, employing a heating element instead of the usual filament. Requires a special design of receiving set for best results.

4. The feeding of alternating current from the house lighting circuit, directly to the filaments of standard designs of vacuum tubes. Requires a special circuit in the receiver with means for balancing out the alternating current hum.

The use of any one of the four methods of "A" current supply just described, combined with a "B" socket-power unit, such as shown in Fig. 18, gives a full alternating current type of power plant.

Automatic Switching of Power Unit Circuits.

Another notable advance in radio power plant design is the use of a power switching relay for automatically connecting and disconnecting the house lighting current at the "A" and "B" socket-power units, when the customary "battery switch" on the face of the radio receiver is operated.

This switching relay is designed for use as a separate unit, thereby providing considerable flexibility in its installation, also as a built-in element of the trickle charge type of storage "A" battery, for use where compactness is essential.

Along with the improvement in radio apparatus, there has been a decided improvement in the quality of programs available, especially those from the larger stations. The introduction of high-powered stations, and the extending of the chain hook-ups to include more stations for programs of great importance, have materially improved reception conditions.

Also, from a business standpoint, radio is well stabilized and is fast becoming an all-the-year around business. This is especially true for the better-made radio products.

In closing, it should be emphasized that radio has opened up a new field which supplements rather than competes with other fields of endeavor. For that reason, if for no other, radio is destined to grow and prosper like other great industries.

District Managers and Executives Discuss Subscribers' Service.

District managers and other executives of the Lincoln Telephone & Telegraph Co. held an all-day meeting on March 25 at the company's headquarters in Lincoln, Neb., for the purpose of discussing the problems and plans of development and methods of rendering greater service to the subscribers.

The company has been pursuing an intensive policy for the last year of finding out what the subscriber wants that can be given to him, and then bending every effort to make the service satisfactory to him.

To this end it has adopted the policy of bringing together at different periods the men in the field who are in intimate touch with the subscribers, and giving them an opportunity to present the latter's desires and the way in which he can be served.

W. E. Bell, commercial superintendent, was in charge of the meeting, and detailed the purposes and struck the keynote of the gathering. J. H. Agee, general manager, spoke briefly along the same lines as to the aims and desires of the management. Among those present were executives of the Nebraska companies recently taken over by the Continental Telephone Co.

Those present were: C. G. Bennett, York; L. P. Young, Hastings; W. H. Caman, Beatrice; H. C. Bratt, Columbus; W. W. Johnson, Kearney; C. E. Pearse, Madison; F. E. Behmn, H. F. McCulla, W. E. Bell, D. G. Bell, C. W. Motter, Clyde Burge, R. M. Woolfolk, R. S. Brewster, Milton Barratt, C. C. Donley, J. H. Agee, H. H. Wheeler, Jr., W. L. Lemon, C. P. Russell, Guy O. Seaton, G. W. Jahn, H. Eggert, K. B. Cary, H. W. Wheeler and J. A. McKinzie, all of headquarters, and representing every partment of service furnishing.

Splice Cables After Worker Narrowly Escapes Death.

Service was restored to hundreds of telephone subscribers in Watertown, N. Y., after strenuous all-night efforts by three cable splicers, laboring through the darkness in a cramped manhole from which a fellow member had narrowly escaped death the day before.

Harry E. McCabe, cable splicer, missed death by inches through quick-wittedness and the equally prompt action of an associate, who hauled him from the manhole when blazing paraffin converted it into a furnace. Mr. McCabe was alone in the manhole with a pot of boiling paraffin. Water, seeping into the hole from the street, dripped into the pot, and instantly it was ablaze.

The interior of the small arch was filled with billowing fire, spurting from the opening like a volcano. McCabe leaped through the red tongues for the opening above him, grasping the edges, but would have fallen back had not another worker seized him by the collar and dragged him forth. His hands were severely burned.

Two cables, one of 500, the other of 300 pairs of wires, passed through the manhole and were involved in the fire, being burned and severed. To restore service to the many subscribers served in the district covered by the cables, it was necessary for the splicers to replace the connections of the 800 pairs.

Owing to the cramped quarters, only three men could work successfully. They stuck to the job steadily, laboring through the night.

New Ohio Company Formed by Consolidation of Companies.

The Greenville Home Telephone Co., the Sidney Telephone Co., the Botkins Home Telephone Co. and the Jackson Center Telephone Co. are all to be consolidated into one company. The new company will be known as the Ohio Telephone Service Co. with headquarters at Sidney, Ohio.

Exchanges will be operated by the new company at Sidney, Greenville, Botkins, Jackson Center, Anna, Ft. Loramie, Bradford, Versailles, New Madison, Ansonia, Aracanum, Rossburg and Gettysburg.

It will serve a population of 75,000 people and will have over $1,500,000 invested in telephone plants and equipment. There will be over 8,000 telephones connected to the new system. No material change in the ownership, officers or present employes is contemplated.

Modern Small Exchange in Virginia

Abingdon, Va., Exchange of Inter-Mountain Telephone Co., Completely Rehabilitated So That Fast and Satisfactory Local and Toll Service is Now Supplied Community—Public Strong Believer in Company and Its Policies

By A. D. Boal,

Advertising Manager, Kellogg Switchboard & Supply Co.

Abingdon, a city of homes, has the name of being, not only one of the most beautiful spots in the state of Virginia, but also the healthiest. It lies 2,200 feet above sea level in the Alleghany Mountains and is surrounded by scenery of marvelous beauty. The altitude of Abingdon as well as its climate is very similar to that of the famed "Land of the Sky" at Asheville, N. C. The ideal climate, combined with pure water and modern sanitation, accounts in a large measure for the health of its residents which, according to the state board of health, is the best in Virginia.

Abingdon is also noted for the high standard of its educational institutions. The name of Washington is perpetuated in Martha Washington College for girls, and another fine women's school is known as Stonewall Jackson College. Nearby is another well-known Virginia school for boys —Emory and Henry College.

Around Abingdon is a rich agricultural section producing tobacco, corn and small grains, potatoes, fruits and hardwood lumber. It is also a stock-raising region, for Washington county is known afar for the high quality of its sheep, hogs and cattle.

Abingdon has a population of about 3,500 people. It is 15 miles east of Bristol, Va.-Tenn., on the main line of the Norfolk & Western Railroad and is the junction point for a branch which runs to Damascus, Va., and West Jefferson, N. C.

Both the transcontinental Lee Highway from Washington, D. C., to Los Angeles, Calif., and the Great Lakes to Florida Highway run through Abingdon.

President W. N. McAnge, Jr., of Inter-Mountain Telephone Co., Bristol, Va.-Tenn., Is Strong Advocate of "Service First" and Public Relations Based on Mutual Understanding.

Its banks, stores, churches and fraternal organizations all emphasize its prosperity, and the enterprise and civic spirit of its people.

With all of these advantages, such a community needs good telephone service, and Abingdon has it. When W. N. McAnge, Jr., president of the Inter-Mountain Telephone Co., directs the management of a property, telephone service must be of the best, for that is one of Mr. McAnge's hobbies.

There are 507 stations served by the Abingdon exchange, of which 289 are local. An average number of 3,212 local calls are handled every 24 hours and 4,100 toll tickets are made out every month.

On November 15, 1926, the Inter-Mountain Telephone Co. cut into service a new Kellogg service switchboard in its new central office, occupying the second floor of a modern brick building. The company's quarters consist of four rooms, designed especially for the new exchange.

The first of these is an operators' restroom with every convenience for the comfort of the operators during their relief periods. Another room is a combination operating room and commercial office. Miss Frances Rush, chief operator and collection supervisor, divides her time between the supervision of service and the necessary commercial work.

Inside the cashier's counter is a group of built-in drawers, designed especially for contract cards, collection stubs, money drawers, trouble cards, etc. Directly below these are built-in cabinets for cashier's and chief operator's supplies.

Directly behind the operating room is the terminal room into which the rear panels of the switchboard open for easy access to all equipment without the necessity for entering the operating room. This terminal room houses the fire chief's desk, line

(*Continued on page* 33.)

Section of Power Room and Workshop—A View of Operators' Restroom in Abingdon Exchange of Inter-Mountain Telephone Co.

AUTOMATIC

e Helps To uate Rates

unity Automatic Exchange) ch adopts it the highest type s possible to obtain. Im- nstant action, twenty-four nging, automatic code call of the features of Strowger

es the telephone service of on a parity with that of the ll centers are willing to pay ere they are unwilling to do nd antiquated methods of

attitude toward automatic just received by Automatic hone and Telegraph Com- f the towns and communi- s favoring the granting of n of the automatic equip- operating under inadequate ntage of automatic opera-

ectric Inc.

West Van Buren Street S. A.

C-A-X

One of the following types of C-A-X's will solve your small exchange problem:

Type 15: A connector-per-line system with a maximum capacity of 12 lines (including trunks), per unit. Can be either common battery or local battery. Dial controlled code ring is used.

Type 16: A common battery line-switch-connector system, with a capacity of 75 lines and 4 inter-office trunks. Automatic code ringing up to ten stations per line.

Type 17: A common battery line-switch-selector-connector system, with a capacity of 200 lines per unit. Automatic code ringing up to ten stations per line.

Type 18: A line-switch-connector system, using existing magneto telephones equipped with dials, and having a capacity of 75 lines per unit. Automatic code ringing up to ten stations per line.

Type 19: A line-switch-selector-connector system, with a capacity of 200 lines per unit. Magneto telephones equipped with dials are used. Automatic code ringing up to ten stations per line.

More Than 3,500,000 Strowger Automatic Telephones in Service or on Order Throughout the World

EQUIPMENT

Methods Of Handling Rural Service
In
Strowger Automatic Telephone Systems

By L. L. RUGGLES
Development Engineer, Automatic Electric Inc.

There are three general methods of handling rural service in connection with Strowger Automatic telephone systems, namely: full automatic, semi-automatic, and manual. The method most suitable in each case is dependent on local conditions or the operating company's preference.

The common battery rural line more readily lends itself to full automatic operation than does the magneto rural line. However, either of these two types of rural lines may be handled by any one of the three methods mentioned in the foregoing paragraph.

In reality, a common battery rural line is a suburban subscriber's party line and may be handled in a manner similar to a party line within the town or city exchange area. Its satisfactory operation is dependent upon the loop resistance of the line, or, in other words, upon whether this resistance is low enough to permit sufficient current to flow through the subscriber's transmitter to produce satisfactory transmission. In view of this fact, the use of common battery automatic telephones for rural service has been given special consideration and transmitters have been designed to meet varying requirements.

When the full automatic method of operation for common battery lines is employed, the lines are terminated on line switches, or, if desired, on individual first selectors if traffic warrants. It is assumed in this case that metallic circuits are used.

The connector switches serving these rural lines are equipped for code or harmonic ringing as required. While in certain cases more than ten parties can be served on a line, undoubtedly a better grade of service can be given by confirming the number of stations to ten on a line.

When the full automatic method of operation for magneto rural lines is employed, each existing telephone must be additionally equipped with a dial having one of its impulse springs connected to ground and the other connected to the center tap of the ringer coils; thus providing simplex dialling through to the central office.

With this arrangement the subscribers may make their own reverting calls, by signalling with the hand generator in the usual manner; this does not operate any of the central office apparatus.

As was the case with common battery lines it is assumed that a metallic line circuit is employed.

At the central office any one of the following three plans may be employed for terminating the lines:

(a) A simplex line switch may be used for the selection of a simplex to loop dialling repeater which is required to repeat the dialling impulses from the line into the loop dialling circuit of the central office equipment.

(b) An individual selector repeater arranged to convert the dialling from simplex to loop may be provided for each line, where traffic or line conditions warrant.

(c) A simplex to loop dialling repeater, connected into the line, may be provided for each line. This method is employed where there are only a few rural lines to be terminated.

Rural lines, either of the common battery or magneto type, may be handled on a manual basis; that is, they may terminate on a toll or an auxiliary operator's position or, when the number of lines warrant, a rural switchboard may be provided. Inter-connection between the rural subscribers and the automatic subscribers is established by the operator. Magneto type lines employing either metallic or grounded circuits can be handled on this basis.

Calls from automatic subscribers in this case are completed over incoming rural trunks from selector levels. Calls from rural subscribers to automatic are completed over dialling trunks. These trunks connect with switch trains having access to the automatic subscribers' lines.

When the semi-automatic method is employed the rural lines terminate as described for manual operation, and calls from rural subscribers to local subscribers are completed in the same manner as when the manual method is employed. Each rural line, besides being terminated at the manual position, has a multiple terminating on connector bank terminals. Calls from local subscribers are completed via the regular switch train through this multiple; the individual subscriber on the line is selected usually by an extra digit suffixed to the rural line number.

Toll to rural connections in this case are usually completed over the regular toll train, thus eliminating the usual direct toll to rural trunks.

When the semi-automatic method of operation is employed, the rural telephones must be arranged to cut off the ringing current from the connector switch. This may be accomplished by wiring the telephone so that the loop circuit will be closed through the hook switch when the receiver is removed.

In conclusion it may be said that all rural lines except those of the grounded type, whether equipped with common battery or magneto telephones, may be handled on a full automatic basis.

This is No. 13 of a series of articles prepared by members of the Engineering Staff of Automatic Electric Inc., covering technical features of the Strowger Automatic Telephone System.

(*Continued from page* 28.)

and cut-off relay racks, main distributing frame and toll test panel.

In the remaining room are located the storage battery, charging apparatus, ringing machines and repairmen's bench. This room also contains the Arcola heater, which supplies heat to the company's quarters.

The Kellogg service switchboard consists of a three-position standard section, wired and equipped for 300 common battery local, 20 toll and 20 rural lines.

The first position has combination toll cord circuits; the second position has automatic ringing, universal cord circuits, and the third position has common battery cord circuits with the following features:

Non-interference.

Secret service—after the connection is established operators cannot listen to subscribers.

Keyless listening—the operator is not required to throw a listening key, but is automatically connected with subscriber on plugging-in.

Answered calls are automatically registered, showing number of calls each operator handles.

Audible multiple busy test on calling cord.

Operators' automatic cut-off (when calling plug is inserted).

Individual four-party harmonic automatic ringing on calling cord—bell rings at intervals until called party answers.

Revertive ringing tone to the calling subscribers. This enables the calling party to hear the ringing and know that the operator has completed the call.

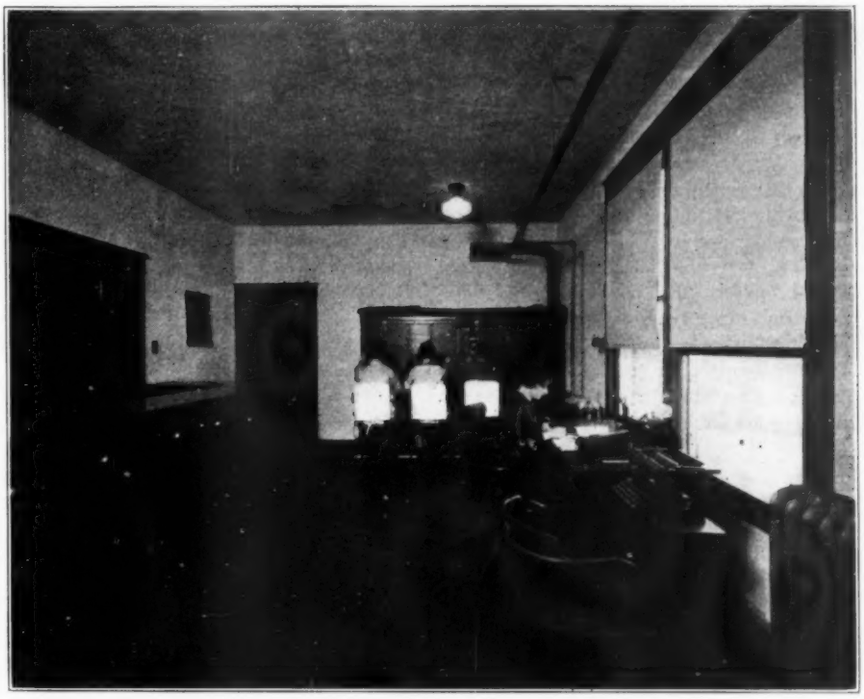
Ringing controlled by calling subscribers. If the called party fails to answer, the ringing stops automatically when the calling party hangs up.

Instantaneous double disconnect on line lamp recall. This feature insures the same fast answer on a recall as that obtained on an originating call. It also immediately removes the busy test when a call is completed, so that the line is available for incoming business whether the operator has removed the cords or not. The switchboard is also equipped with multiple line lamp distribution, making every call available to any operator.

Dark keyshelf.

Positive supervision—lighted lamps on keyshelf always have definite meaning to operators.

These features which insure modern telephone service are also contained in the Inter-Mountain Telephone Co.'s switchboard at Bristol and Johnson City.



Operating Room and Commercial Office of the Abingdon Exchange, Inter-Mountain Telephone Co., Bristol, Va.-Tenn.

As previously mentioned, an average of 3,212 local calls per day is handled with this equipment, besides the toll business. The average number of local calls handled per busy hour per operator is 320, and the maximum handled by one operator in the busy hour, 450.

With the installation of new central office equipment, 85 per cent of the outside cable plant and about half of the open-line construction was entirely rebuilt. The new cable is of 400-pair capacity and is constructed through alleys for a distance of 1½ miles, forming the backbone of the cable plant. This new cable replaced many small cables and open wires.

All of the old cable, which was made up of several small cables, open-wire and pole routes along the main streets was removed, resulting in a greatly improved appearance of these thoroughfares. This improvement on the part of the company has met with much commendation from the public generally.

The new cable is made up with a toll core and these circuits carry the Inter-Mountain toll circuits, the Chesapeake & Potomac Telephone Co. circuits and the American Telephone & Telegraph Co.'s toll lines. The pairs used by the Chesapeake & Potomac Telephone Co. and the American Telephone & Telegraph Co. are loaded circuits.

The toll core cable has made it possible to abandon all of the heavy open-wire toll routes out of Abingdon for a distance of 2½ miles. This has also resulted in a great improvement to the appearance of the main highways. Co-ordinated with

View in Terminal Room of Abingdon, Va., Exchange Showing Rear Panel of Kellogg Service Switchboard.

the improvements, the entire toll route of the Inter-Mountain Telephone Co. from Bristol to Abingdon, a distance of 15 miles has been rebuilt, using 30 and 35-foot class A chestnut poles. All of the No. 10 B. W. G. steel wire was replaced with No. 12 N. B. S. copper wire and these circuits arranged in phantom groups.

Since the rebuilding of the outside plant only about one-half of the usual expectancy of trouble has been experienced, whereas before the reconstruction there was from three to four times the usual amount of trouble.

In consequence of this improvement in plant construction and the fast service rendered by the new central office equipment, the subscribers of the Abingdon exchange are loud in their praises of the service and compliments are daily received in which are mentioned prompt answering, clear transmission, quick recalls and fast toll service.

The officials of the Inter-Mountain Telephone Co. with headquarters at Bristol, Va.-Tenn. are: W. N. McAnge, Jr., president and treasurer; Leland Hume, vice-president; W. G. Snapp, auditor, and A. E. Reynolds, assistant secretary.

The local management of Abingdon is under the supervision of S. T. Griffin, plant manager, and Miss Frances Rush, collection supervisor and chief operator.

President W. N. McAnge, Jr., believes in "Service First." He also believes in taking the public into his confidence by putting the business of telephony on the sound basis of mutual understanding between the operating company and its patrons.

The public whom it serves believes in the Inter-Mountain Telephone Co. and its policies; and nowhere will be found better relations than those existing between the citizens of Abingdon, Va., and the officials of the telephone company which serves them. These facts are true of the relationship existing between the subscribers and the Inter-Mountain company at Bristol, Johnson City and all other exchanges which the company operates.

Telephone News Items From Europe

Novel Experiment Being Conducted by Telephone Development Association of Great Britain Regarding Installed Telephone Service in New Houses—Proposed Expansion of Russian Telephone Service—Development in Ireland

By "Telephony's" Special Correspondent

The Telephone Development Association has launched a novel experiment to test the theory that, if telephone service were provided as a matter of course in every house above a given social line, in the same way as electric light, gas and main water are provided, the number of people who would *not* take advantage of the service would be strikingly small.

In connection with the Ideal Home Exhibition at Olympia which extends over practically the whole of March, and which can now almost be regarded as a national institution, the association has arranged a free ballot where the daily prize is the payment by the association of the first year's rental of a telephone in any private residence situated within the "free" radius of 1½ miles from an existing exchange.

Every applicant receives a form of entry with an individual number, and the holder of the number, which is drawn each evening, is entitled to have his, or her, first year's rental of the telephone paid by the association. Naturally, the offer has been widely advertised and is attracting thousands of applicants.

It will be interesting to know, a year hence, how many of the 23 lucky winners, having tested the benefits and convenience of telephone service in their home, will give up the service rather than face the payment of a rental which, in the case of a private residence, does not exceed half-a-crown a week.

Apart from the value of the experiment as testing a theory which most telephone men believe to be well founded, the propagandist value of this idea is considerable. It will be agreed that, at any rate, a considerable proportion of the applicants will be thinking, either silently or aloud, about the idea of having their own telephone for at least a month—that is, until the final results are announced on March 31.

In addition, it is equally probable that a goodly proportion of them, on learning that their hopes of free telephone service for a year are not to be realized, will have grown so much in love with the idea that they will make up their minds to become subscribers to the British national system.

Moscow to London

The Soviet Commissariat for Posts and Telegraphs purposes to spend 120,000,000 roubles (nominally about 50,000 dollars) during the next five years on improving and enlarging the Russian telephone service.

The plans include the extension of the present inter-city system southwards to Tiflis in Georgia, and eastwards of Sverdlovsk.

Continuous telephone lines are to be carried to the Polish and Latvian frontiers. These, in conjunction with projected improvements in the telephone systems of Central Eureopean countries, will put Moscow into communication with London, Berlin, Paris and other European countries.

England's Rural Telephones

At a meeting of the council of the National Farmer's Union in London, it was stated, in explanation of the slow progress made by the telephone in rural districts, that the Post Office authorities have entered into an agreement with the railway companies to provide telephones at as many rural stations as possible.

The stumbling block in the way of the general adoption of this plan is that where receipts are not likely to equal expenses, the Postmaster General requires a guarantee from the railway companies of some £11 per annum. The companies are not prepared to give this guarantee and the Post Office refuses to alter the conditions.

If rural telephones are to be extended, therefore, the best method seems to be a joint guarantee from the Farmers Union and the railway companies.

Irish Telephone Development

The telephone capital bill, under which it is proposed to advance £500,000 (about $2,500,000) for telephone development in the Irish Free State, has passed its second reading in the Dail Eirann.

A considerable part of the money will be spent on new buildings rendered necessary by the increasing use of the telephone. Dublin is to have two automatic exchanges.

Until the Free State took over the telephone system, it was conducted at a loss which in 1922-1923 amounted to £46,000. This was reduced to £25,000 in 1923-1924, and in the next year it disappeared. With reduced charges, the loss reappeared, and in 1925-1926 it was £35,000. It is expected to disappear again in 1927-1928.

Belfast Looks Ahead

Owing to the growth of the telephone system in Belfast there has for some time been serious congestion at the Central exchange in Queen street, and the authorities have been searching for a convenient site for the erection of a new building.

Negotiations have been concluded for the purchase of the entire block of property at the junction of May street and Cromac street, and building operations will begin as soon as possible. The automatic system will be installed, but it will probably not be ready for use for four or five years.

The new building will provide for the telephone needs of Belfast for 50 years to come.

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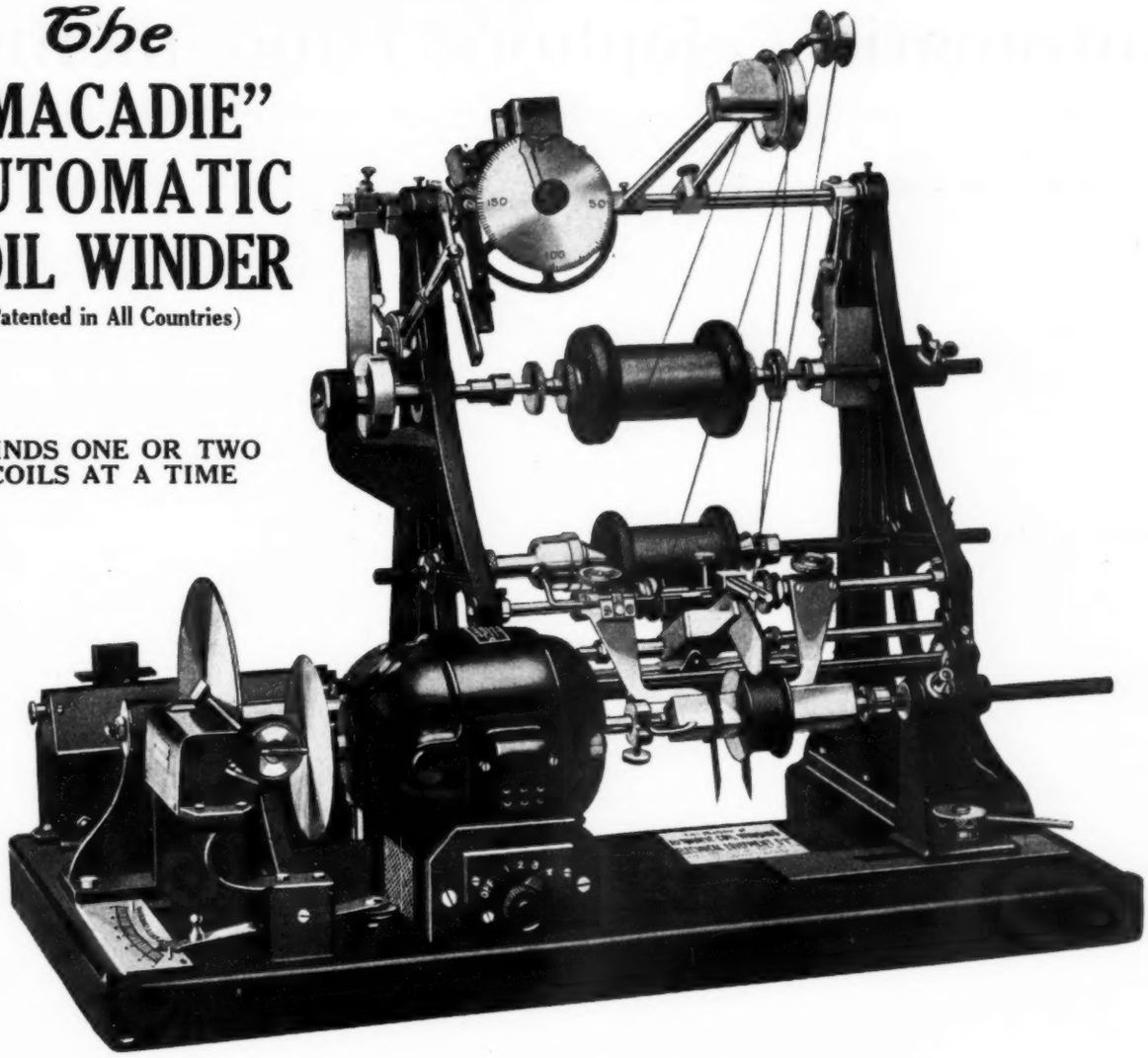

The "Macadie" Winder

has been described by one of the largest Electrical concerns, as

"THE FINEST COIL WINDING PROPOSITION THAT HAS EVER BEEN PUT ON THE MARKET."

This testimonial was given two years ago, since when we have greatly improved the general construction of the machine, and made additions, many of which our customers have suggested.

Keep pace with the march of Progress

TO reduce to a minimum the human element is the aim of all manufacturers. The winding of coils has, in the past, called for knowledge and skill on the part of the operator.

Investigate the merits of the "Macadie" machine, you can do this easily and quickly—our new booklet tells the whole story.

Coils ranging in size from ⅛" to 5" can be wound at any desired speed and tension up to 6,000 revs. a minute. The shape of the coil does not matter—it can be round, flat, rectangular or irregular.

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has been installed in the principal Electrical Works throughout the world.

FOR TELEPHONE FACTORIES, ITS INTRODUCTION INCREASES OUTPUT, REDUCES COSTS, AND STILL MORE IMPORTANT, PRODUCES PERFECTLY WOUND COILS.

We advertise these facts but give proof.

A sample machine has resulted in an order for NINETY, in another case, FIFTY-FIVE.

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WE ARE DESIROUS OF ENTERING INTO AN ARRANGEMENT FOR THE SOLE SELLING OR MANUFACTURING RIGHTS OF THE "MACADIE" WINDER FOR THE U. S., AND INVITE CORRESPONDENCE FROM ANY FIRMS OR INDIVIDUALS OF FIRST-CLASS STANDING

When Writing to Automatic Coil Winder & Elec. Equip. Co., Ltd., Please Mention TELEPHONY

Automatic Telephone Fundamentals

This Is One of Series of Articles Explaining in Simple Terms the Mechanical and Electrical Basis of the Strowger Automatic Telephone System, Which Appear Weekly in TELEPHONY — Part 14, The Primary and Secondary Line Switches

By Arthur Bessey Smith, Ph. D.

In a large central office, it is necessary to handle large amounts of traffic with as small an amount of equipment as possible. Large numbers of telephones offer a more steady total calling rate than small numbers, so that greater economy is possible.

One way is to mingle the traffic from a number of groups of subscriber lines, so that each subscriber has access to more than ten first selectors. This is done by interposing secondary line switches between the (primary) line switches and the first selectors.

The 25-point rotary line switch lends itself readily to secondary work. One method of arrangement is shown in Fig. 51. At the left are shown primary line switches of the plunger type, customarily arranged in groups of 50 for eight trunks to secondary rotary line switches.

These secondary switches are arranged in as many groups as there are trunks out of each primary shelf—8 in this case. There will be as many secondary switches in each group as there are primary shelves feeding into them. This permits the eight trunks from a primary shelf to be scattered over eight groups of secondary switches, one per group.

Each secondary switch has access to 25 trunks, each ending in a first selector. Thus each primary line switch has potential access to 200 first selectors, though a less number is often used by multipling.

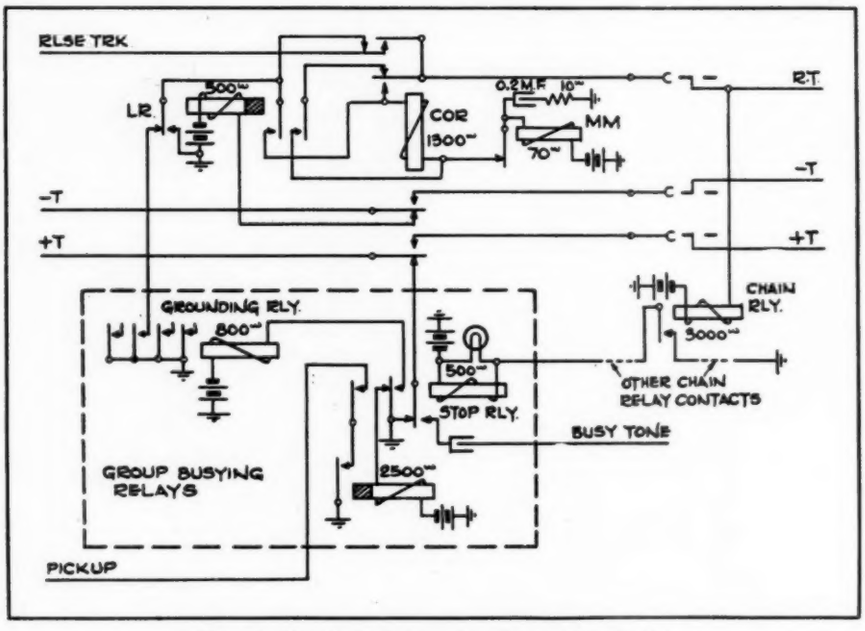

Fig. 52. Circuit of Rotary Secondary Line Switch.

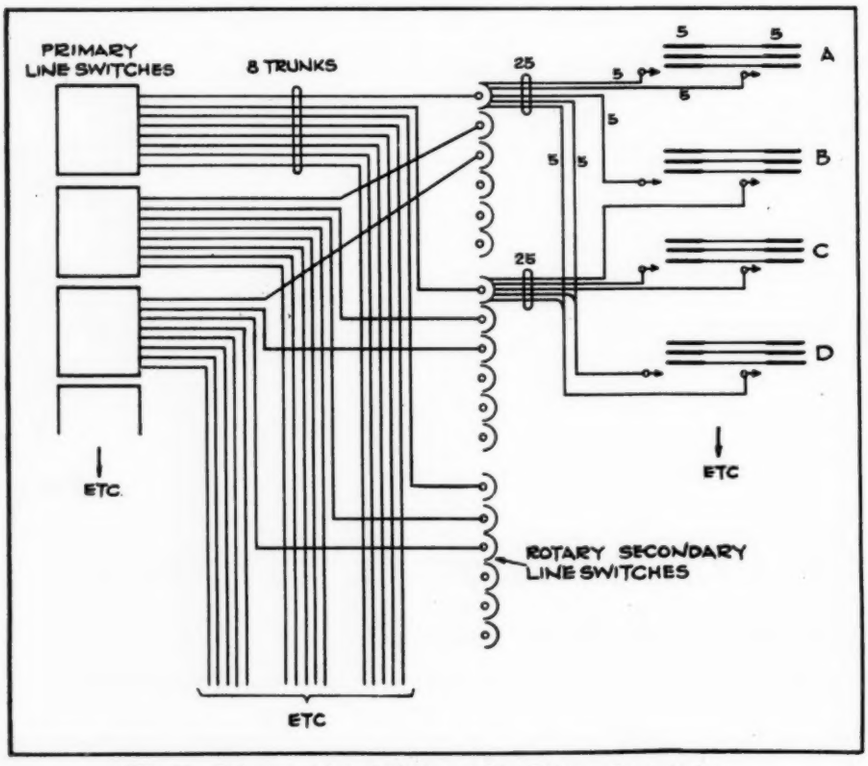

Fig 51. Primary Line Switches with Rotary Secondaries.

One of the ways of trunking the secondary banks to the first selectors is shown. Shelf *A* has 10 selectors, all rereceiving calls from the first group of secondaries. Five trunks from this same group go to five selectors on shelf *B*. Shelf *C* gets 10 trunks from the second group of secondaries, with five going to shelf *B*. The remaining 10 trunks from both groups of secondaries are multipled together and run to shelf *D*. This kind of distribution may be carried out through all the banks and shelves.

The circuit of the rotary lines switch when used for secondary work, Fig. 52, differs somewhat from that of the primary switch. If all the 25 trunks on its bank are busy, there must be a device which will make it impossible for more calls to come to it; in fact, to the entire secondary group to which it belongs. Also, it may be that some primary lines switch plunger has just released and has not been picked up by its masterswitch. If such a subscriber calls again at once, he will get nothing.

Therefore, every time a secondary group becomes busy—all 25 trunks busy—something must cause each primary master switch, whose trunks run to the busy secondary group, to sweep over its arc and pick up all idle plungers. These functions are performed by the group busying relays shown within the inner rectangle of Fig. 52.

Connected to the release trunk on the

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secondary bank is a chain relay, which is energized whenever the trunk is busy. Since there are 25 trunks, there are 25 such relays with their contacts in series with each other.

When all are energized, the stop relay acts, cutting ground off the $+T$ and putting on a busy tone. It operates the grounding relay which makes busy each release trunk so that primary master switches will find it busy.

It also places a momentary ground on the pick-up wire, which causes each master switch to sweep over its plungers at least once, picking up all idle plungers. The latter is done by releasing the 2,500-ohm slow relay, but connecting its front contact first to the pick-up wire. The time delay of release furnishes the necessary pulsation.

The line relay, *LR*, of the secondary rotary line switch has more work to do than its counterpart on the primary rotary line switch. It cuts off the grounding wire and grounds the release trunk, connects the cut-off relay, *COR*, to the release trunk, and connects the motor magnet, *MM*, for action.

This switch remains where used last and when seized does not rotate unless the trunk is busy. No interlock between *LR* and *COR* is necessary. During occupancy only *COR* is attached to the release trunk.

(*To be continued*)

Excellent Program for Kansas Convention Next Week.

The 27th annual convention of the Kansas Independent Telephone Association will be held next week at Manhattan, headquarters being at the Gillett Hotel. The convention opens on Tuesday, April 5, and closes Thursday, April 7.

General sessions will be held in the Community House. The four sessions of the traffic school will be held at the Telephone Building. The traffic school will be in charge of Ralph Van Trine, traffic manager, United Telephone Co., Abilene.

The program contains so many good things that no Kansas telephone man can afford not to attend. Undoubtedly live telephone men from adjoining states will attend to hear discussions of problems in which they are interested.

Tuesday morning will be given over to registration, renewal of acquaintances and a meeting of association's executive committee.

The program in full follows:

TUESDAY, APRIL 5, 1:30 P. M.

Community Singing led by H. E. Buchanan, commercial superintendent United Telephone Co., Abilene.

Song, "America" led by H. E. Buchanan.

Invocation, by Rev. W. U. Guerrant, student pastor, Presbyterian church.

Address of Welcome, by S. A. Bardwell, Manhattan Chamber of Commerce.

Response to Address of Welcome, by Fred Coulson, assistant general manager, United Telephone Co., Abilene.

Address of President, T. L. Youmans, Osawatomie.

Secretary's Report, by L. M. Kraege, Topeka.

Treasurer's Report, by V. E. Chaney, Kansas City.

Appointment of Committees.

"Public Utilities Publicity and Advertising," H. W. Davis, professor of English, Kansas State Agricultural College.

"Value of Engineering to a Small Telephone Plant," by Samuel Tucker, Pleasanton.

"Program Service to Subscribers," by J. A. Gustafson, Fredonia.

"The Way it Sometimes Is and the Way It Ought to Be," by Miss Anne Barnes, Des Moines, Iowa, traffic representative, United States Independent Telephone Association.

WEDNESDAY, APRIL 6, 9:15 A. M.

Community Singing led by H. E. Buchanan, Abilene.

"Effects of the Depreciation Order of the Interstate Commerce Commission on Accounting Departments of Telephone Companies," by V. E. Chaney, Diversified Investments Inc., Kansas City.

Address by C. W. Motter, superintendent of publicity, Lincoln Telephone & Telegraph Co., Lincoln, Neb.

Address by F. B. MacKinnon, president, United States Independent Telephone Association, Chicago.

"Engineering at the Kansas State Agricultural College," by R. A. Seaton, dean division of engineering and director of engineering experiment station.

"Some Results Obtained by Different Telephone Companies in Rendering Radio Program Service," by B. H. Piepmeier, Kansas City.

WEDNESDAY, 1:30 P. M.

Community Singing led by H. E. Buchanan of Abilene.

"Regulation of Public Utilities," by T. J. Anderson, associate professor of economics, Kansas State Agricultural College.

"A Proposed Telephone Short Course," at K. S. A. C. by R. G. Kloeffler, professor, electrical engineering.

"My Trip to Europe," by C. L. Brown, president, United Telephone Co., Abilene.

Address by L. T. Hussey, chairman, Kansas Public Service Commission, Topeka.

Demonstration of First Aid, by team from United Telephone Co.

Convention Picture and Dedication of New Telephone Building.

Inspection of College Campus and Some of the Engineering Laboratories.

WEDNESDAY, 6:30 P. M.

Annual Banquet.

Toastmaster, Dr. Howard T. Hill, head of public speaking department, Kansas State Agricultural College.

Introduction of Visitors.

Address, by Dr. F. D. Farrell, president, Kansas State Agricultural College.

Dancing.

THURSDAY, APRIL 7, 9:15 A. M.

Community Singing, led by H. E. Buchanan, of Abilene.

"Systematized Work and How it Will Help the Managers of Small Telephone Properties," by H. M. Cox, Kansas City.

"Sunshine and Health," Dr. J. S. Hughes, professor of chemistry, Kansas State Agricultural College.

"Recent Changes in the Compensation Law," by Judge J. H. Crawford, with Kansas Public Service Commission.

Reports of Committees.

Election of Officers.

Miscellaneous Business.

Closing Remarks by President T. L. Youmans.

Operates Exchange at $6,250 Loss; Not "Telephony" Subscriber.

George Mayes, who owned and operated the Sanger Telephone Co., Sanger, Texas, for the past 24 years, recently sold it to Mrs. L. B. Riley and son, W. K. Riley, of Waldo, Ark.

He was station agent and telegrapher for the Santa Fe Railroad for 13½ years and during that time saved enough from his salary to build the plant. The first two years he operated the exchange, he had 27 subscribers, and it was necessary to take part of his salary to help pay the operating expense.

After the second year, the business increased to 57 telephones, and in a few years it was paying its own way.

During the 24 years of his ownership, Mr. Mayes said he had lost $6,250 by owning the exchange, as he sold other property at various times to supplement the telephone business.

The new owners have been operating an exchange at Waldo for the past ten years and have already taken charge of the exchange at Sanger.

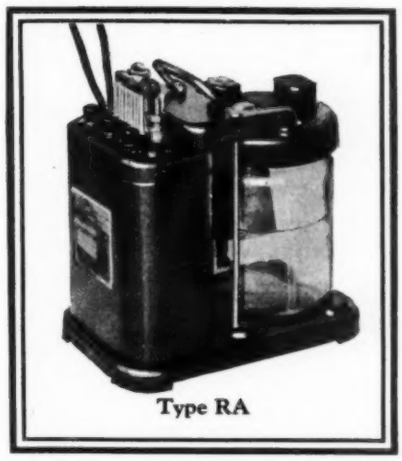
Ravens Break Down Lines Near Midland, Texas.

Ravens have become such a pest to the telephone lines near Midland, Texas, that severe measures are being carried out.

Nightly, employes of the Southwestern Bell Telephone Co. and the American Telephone & Telegraph Co., sit along the route of the companies' wires with shotguns across their knees, ready to shoot the birds which have broken down wires.

R. E. Whalen, chief test board man for the Southwestern Bell Telephone Co., at Midland, appealed to County Agent H. L. Atkins to devise means for poisoning the pests. Shelled corn, poisoned with strychnine, will be placed in boxes nailed to crossarms on the telephone poles, Mr. Atkins said.

The birds travel in such large bands that when they pass over they almost darken the sun, farmers near Midland assert.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for magneto switchboards and other low voltage uses

Here is the famous Balkite Charger made in a small size for use with low voltage batteries. Except for the difference in capacity it is just like the Balkite Charger type RB used on PBX and similar batteries. These are some of its outstanding advantages.

1. It is shipped ready to install.
2. It is compact.
3. It is low in price.
4. It charges batteries of 1 to 6 cells [2 to 12 volts].
5. It is a truly universal unit for it will operate on any 115 volt A. C. supply of from 25 to 140 cycles.
6. It charges continuously at rates up to ¾ ampere.
7. It charges the battery while it is in use [a filter unit can be furnished in the few cases where it is necessary].
8. Its charging rate is readily adjustable.
9. It operates on the well known unfailing Balkite principle of electrolytic rectification.

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Fansteel Products Company, Inc.
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What the Commissions Are Doing

Up-to-the-Minute News Regarding the Activities of State and Interstate Commissions, Courts and City Councils in Matters Concerning Telephone Companies—Summary of Commission Orders and Schedule of Telephone Hearings

Denies Employes Discharged Because of Legislative Vote.

The two Democratic members of the house of the Massachusetts legislature, who were suspended by the New England Telephone & Telegraph Co. immediately after voting for an investigation of the company, were not suspended because of their vote, declared Charles S. Pierce, vice-president of the company, at a hearing before the rules committee of both branches, acting concurrently.

"It was unfortunate, but purely incidental," said Mr. Pierce, "that these two men had been notified of their suspension after they had voted for an investigation of the company. But there is no connection whatever."

The officers of the company decided several years ago, said Mr. Pierce, that all employes elected to the general court not only in Massachusetts but in legislatures in other New England states in which the company operates, should be asked to take a leave of absence during the session "so that both the company and the legislatures are able to say that this connection has ceased."

Questioned by two members of the committee as to when these men could return to work, Mr. Pierce said that they might resume work after the end of the session, subject to the rules of sobriety and honesty governing all employes and "if there is work to do."

These two members would not be prejudiced in the slightest, nor would the two Republican members who voted against the investigation be favored.

Mountain States Company Purchases Colorado Property.

The Interstate Commerce Commission on March 16, authorized the acquisition by the Mountain States Telephone & Telegraph Co. of the properties of the Cheyenne County Telephone Co., Cheyenne Wells, Colo.

The Cheyenne County company owned and operated an exchange which served approximately 130 subscriber stations, together with toll stations in the villages of Wild Horse, Arena, First View, and Arapahoe, all in Cheyenne County, Colo. Its plant included 49 miles of toll pole lines.

By a contract made January 28, 1927, the Mountain States company agreed to purchase all of the properties of the Cheyenne County company for $16,046.39, payable in cash.

An appraisal made by engineers of the Mountain States company found the reproduction cost new of the properties to be $31,773.48, and less depreciation, $14,561.14. The estimated value of property to be retired from service is $14,209.61 and the cost of removing the useless plant is expected to total $5,445.14, less salvage of $299.70. In 1925, revenues and expenses of the Cheyenne County company were $4,765.89 and $4,768.80, respectively.

For several years the Cheyenne County company had operated its system at a loss, and had been unable to take care of depreciation and to make additions and betterments. As a result, its service was unsatisfactory and inadequate. Its toll lines connects with the long distance line of the Mountain States company at Aroya and extends easterly along the route of the Union Pacific Railroad to Arapahoe. This toll line is an iron grounded circuit, unsuitable for long distance service.

The Mountain States company plans to replace the iron grounded circuit with a copper circuit and to extend it easterly to the Colorado-Kansas state line. The United Telephone Co., another Bell-controlled company, will extend its toll line westerly to connect with the new line of the Mountain States company. This will give the people of Cheyenne Wells and the surrounding territory improved long distance service to points on the Bell system, especially to towns in Colorado and Kansas, where such service is particularly required.

The Mountain States company will rebuild the plant at Cheyenne Wells, and install a modern exchange which will give the community satisfactory local and long distance service. Party-line service, both business and residence, will be added to the present individual line service. When the rehabilitation program is completed, the necessary changes in the exchange rate schedules will be made, subject to the approval of the Colorado Public Utilities Commission.

At the hearing, communications from a number of representative telephone users were introduced in evidence, all favoring the proposed acquisition.

Maryland Public Utilities Board Visits Baltimore Exchanges.

Members of the Maryland Public Utilities Commission and Ralph B. Fleharty, people's counsel of Baltimore, recently inspected certain features of the telephone exchange there as guests of the Alfred E. Berry, president of the Chesapeake & Potomac Telephone Co.

The commission made a tour of inspection of the main office of the Washington exchange and several of the branch exchanges. The commission concentrated its attention on the telephone company as the rate case involving this utility probably will be the first of the major problems now pending to be considered.

Mr. Fleharty said he hoped to have the commission set a tentative date for resumption of the telephone rate case hearings started before the old commission last fall at its next meeting.

John W. Childress, chairman of the commission, indicated that it might be some time before any of the important questions are taken up, as it is the desire of the commissioners to make a thorough study of the utility problem in order to get a good background for procedure.

Turlock (Calif.) Property Sale to Pacific Bell Approved.

The Interstate Commerce Commission on March 18 decided that the acquisition by the Pacific Telephone & Telegraph Co. of the properties of the Turlock Home Telephone & Telegraph Co., Turlock, Calif., would be of advantage to the persons to whom service is to be rendered and in the public interest, and issued a certificate to that effect.

The Turlock company owned and operated an exchange in the city of Turlock, Stanislaus county, Calif., which served, as of September 30, 1926, 1,586 subscriber stations. No exchange was maintained by the Pacific Telephone & Telegraph Co. at Turlock, but its toll line passes through the city and connects with the exchange of the Turlock company.

By a contract made January 17, 1927, the Pacific company agreed to purchase all of the properties of the Turlock company, except cash on hand and accounts receivable, free of any lien or incumbrance, for $100,000, payable in cash.

An appraisal made by one of the Pacific company's engineers found the reproduction cost new of the properties to be $86,926.16, and less depreciation, $74,750. None of the acquired properties will be retired from service. In 1926, revenues and expenses of the Turlock company were $37,828.94, and $37,355.77, respectively. No change in rate schedules is in immediate contemplation.

All of the capital stock of the Turlock company was owned by its president and his immediate relatives. The president is a man of advanced age and for some years he and the other stockholders had desired to dispose of the plant and to retire from the telephone business. To that end they instituted negotiations with the Pacific Bell

Here's the long and short of it

THERE are a lot of things you can do with a heavy nine-inch lineman's side-cutting plier that you can't do with a four-inch round or flat-nose plier. You can do things with the small one that you can't do with the large one. BUT—whether your job is one for a large or small plier, a round nose, flat nose, chain nose, "duck bill," reamer, needle nose or combination, this is ALWAYS TRUE: If it is a Crescent and Smith & Hemenway tool it grips or cuts with sure precision—and keeps on doing it. The special steel in these tools keeps cutters keen and true and the jaws firm.

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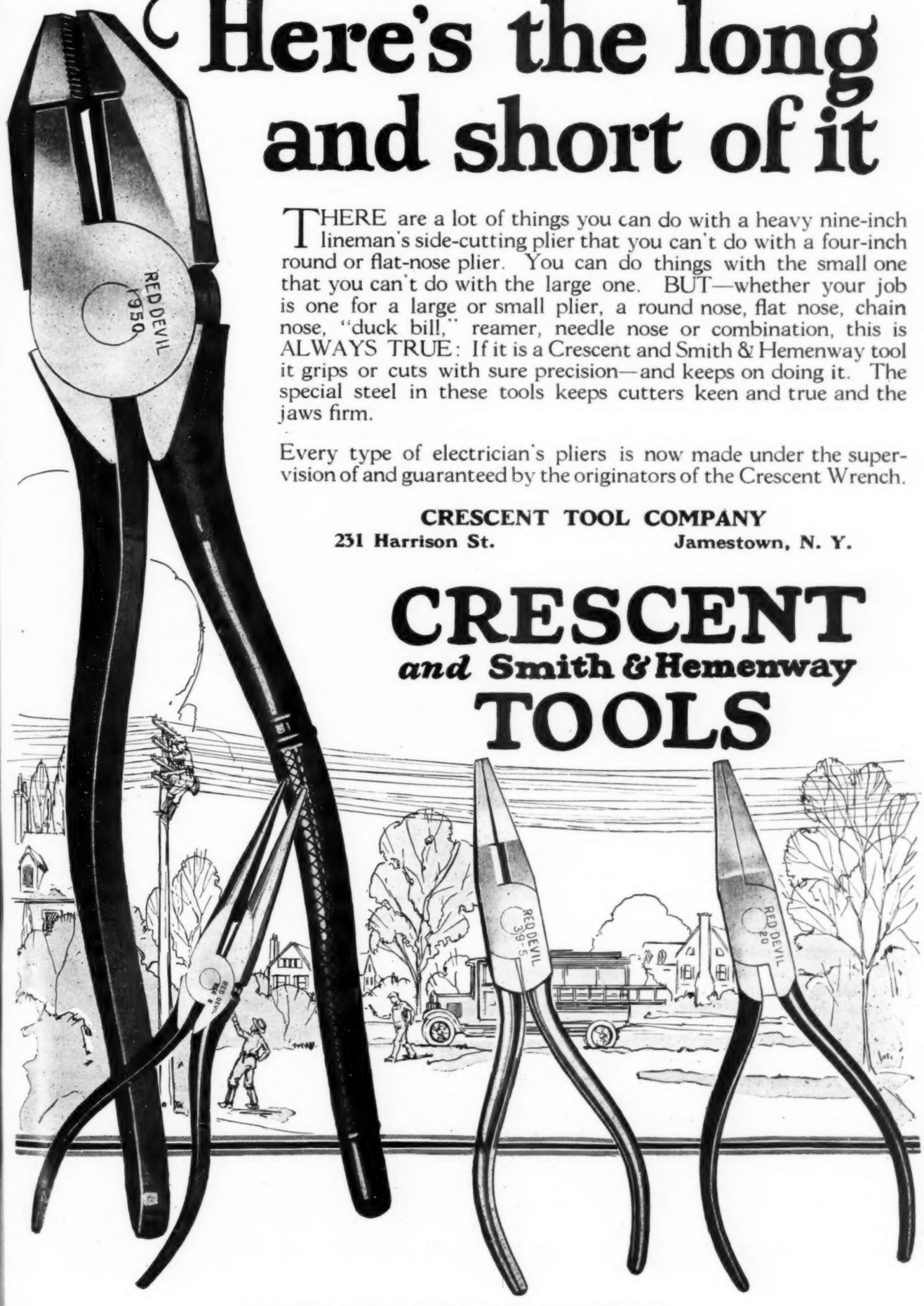

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for the sale of the properties. It appeared that they had been unwilling to expend the necessary capital to meet the cost of additions and betterments constantly demanded by the growth of the business.

The city of Turlock is located in a prosperous agricultural and horticultural district and the Pacific company believes that by improving the service, it can develop the business and increase the revenues.

At the hearing, communications from the chairman of the city council, chamber of commerce, the Rotary Club, and the Exchange Club of Turlock, and from the large number of representative business houses and other telephone users were introduced in evidence, most of them approving the proposed acquisition and the rest stating that they had no objections.

Telephone Company Benefits from Railroad Station Charges.

A number of small-town railroad stations in Nebraska are being closed so far as agency service is concerned, and custodians substituted, by order of the state railway commission.

This is because the short-haul freight and express is being largely carried by trucks, and the revenues no longer justify the higher expense of an agent, which is around $1,800 a year, while a custodian costs but $400. The changes will bring some added revenue to the telephone companies serving these towns, most of them by lines from other towns.

The order of the commission in each case usually is that the railroad company use the telephone to get telegraphic messages to the towns where there are telegraph operators.

Where this service is not available, the railroad companies are ordered to build private telephone lines, sometimes five or six miles. This line is not to be used for any business other than that of the company, customers being permitted to telephone the custodian for information as to shipments and train service.

Rates Made Permanent After Experimental Period.

The Nebraska State Railway Commission has made permanent the schedules granted as a six months' experiment last fall for the Angier Telephone Co., a new corporation.

The commission finds that the operating expenses of the company are $82 a month and the revenues $81.50, the latter made up of $68.50 exchange and $23 toll revenue, as an average. Under such a showing it is evident that the rates are not excessive; and the company, being apparently willing to continue them as now in force and approved, it was ordered that the rates be indefinitely continued.

The commission also continued for an indefinite period the schedule it approved in March, 1926, for a year, for the Ayr district of the Glenwood Telephone Co. The company has been keeping its books for the first time under the rules of the accounting department of the commission.

These show revenues of $1,095.73 for the year and operating expenses of $1,198.36, a deficit of $102.63. The company not suggesting any change, and it being evident the rates are not excessive, the commission makes them permanent, without a hearing.

COMING CONVENTIONS.

Kansas, Manhattan, Gillett Hotel, April 5, 6 and 7.

Iowa, Des Moines, Fort Des Moines Hotel, April 19, 20 and 21.

Ohio, Columbus, Neil House, April 27, 28 and 29.

Pennsylvania, Harrisburg, Penn-Harris Hotel, May 3, 4 and 5.

New York, Rochester, Powers Hotel, May 25, 26 and 27.

Wisconsin, Madison, Hotel Loraine, June 7, 8 and 9.

Nebraska Commission Denied Discretion in Reports Required.

The Nebraska legislature has indefinitely postponed a measure that would have permitted the state railway commission full discretion in the matter of what reports shall be asked for from the common carriers, including telephone companies.

When the bill was before the senate, it received the approval of that body, but in the house it was killed on the representation of Representative Cone, radical, from Douglas county, who said that the measure was being asked for by the Northwestern Bell Telephone Co., and that it wanted it so that the people of Nebraska might not be able to know who are owners of its stock in the state.

The joke of this is that all of the stock of the company, so far as the present records of the commission show, is held by the American Telephone & Telegraph Co. Ten shares are held by officers, in order that they may qualify as directors, but under a contract that these shall be assigned to the parent company when demanded.

When the state first began regulation the legislature passed a law, the one now sought to be repealed, which listed at great length the kind and character of reports that the carriers must file with the commission. The carriers have to do this, or else run the risk of a heavy fine. In the 20 years since then, the need for some of these reports has vanished, but they still keep coming in, costing the companies a considerable amount of money, and the state has a clerk to take care of them, at public expense.

Members of the commission say that the demand for a list of stockholders was predicated on the notion that the public would be interested in knowing who owned stock in the utilities so that it might gauge their interest when a rate battle was on. Yet in all the 20 years that these lists have been available, not a dozen taxpayers have asked to see them, and the principal demand, which is small these days, is from stock salesmen looking for prospects.

Against Extension of Rural Line Into Another's Territory.

The Nebraska State Railway Commission has laid down the rule that, unless there is a substantial demand for rural service, it will not permit any telephone company to extend its lines into territory occupied by another company merely because the company feels the need of such supplemental service and revenues.

The matter came before it on the application of the Citizens Telephone Co., of Paxton, which has an exchange but no rural lines. In the territory north of the town naturally tributary to it the Sutherland Telephone Co. has been maintaining a number of lines, several of them being switched by the Paxton company.

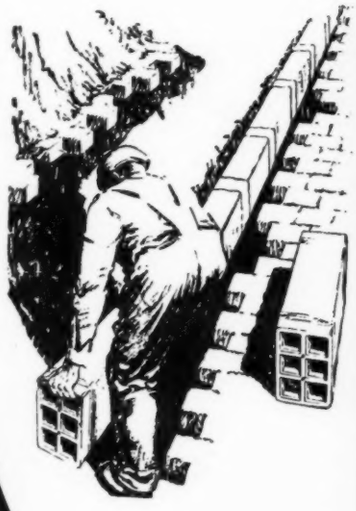
The commission says that to permit the building of competing lines into this territory would be an additional burden on the community, and that it would be a wasteful use of capital which can better be employed in giving duplicate service. Unless there is a general demand for such service, which does not appear to be true, it is inadvisable to permit such construction. So an order was issued to that effect.

The commission upheld the complaint of the Paxton company that it is entitled to be paid for switching one of these Sutherland company rural lines, the same rate that is paid it for other switched lines, 60 cents a month. The Sutherland company has been paying the regular rate on one line, but on another has been getting free service.

The Paxton company asked that the Sutherland company be ordered to pay for this free service, or else that it be allowed to discontinue it. The commission says this is a reasonable request, and grants it, as this would put all lines on a parity. If the switching service is discontinued, the commission will allow a toll to be charged between Sutherland and Paxton.

Authorizes Increased Rates for 24-Hour Service.

Dr. A. E. Hedlund and other patrons of the Dalton Telephone exchange, complained some time ago to the Nebraska State Railway Commission that the hours of service were insufficient. This has re-



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When writing to Fire Proofing Co., please mention TELEPHONY.

sulted in an amicable agreement between the subscribers and the company, now ratified by the commission, by which the company will give a 24-hour service and, in return, will secure rates that will add $455 a year to its revenues.

The commission sent a representative to Dalton, and he found two operators are employed at a total cost of $130 a month. The business men said they were willing to pay enough additional to meet the increased expenses. The secretary of the Community Club advised the commission that at a public meeting the matter was discussed and the sentiment was unanimous for a change in service on those conditions.

The schedule approved gives an increase on all existing services, but 25 cents a month less than the company asked. The present business rate of $2.50 for business desk telephones was increased to $2.50; business wall telephones from $2.00 to $2.25; and residence desk and residence wall telephones from $1.50 each to $2.00 and $1.75 respectively.

The company's request was based on the employment of an additional full-time operator. The commission advises that the working hours of the two operators be so arranged that the night operator, who is available at present for emergency calls, be employed for full time and an hour or two added to the day operator's time.

The commission also increased switching rates from 50 to 60 cents a month, and lays down the rule that there should be a differential of 25 cents a month between wall and desk types of equipment.

Revision of Virginia Long Distance Tolls Requested.

Changes in the long distance toll tariffs of the Chesapeake & Potomac Telephone Co. were asked in an application filed with the Virginia State Corporation Commission recently.

Substitution of ten-mile steps for eight-mile steps for distances beyond 80 miles and of 12-mile steps for eight-mile steps beyond 150 miles, the privilege of reversing charges on station-to-station calls, a reduction of 25 cents on station-to-station messages between 7 p. m. and 8:30 p. m., and a minmum charge of 35 cents for the initial period of three minutes, are the four changes requested by the Chesapeake & Potomac company.

The commission directed the company to advertise its proposals throughout the state. The changes became effective April 1, unless some opposition developed.

Company's Side Concluded in Ashland, Ohio, Rate Case.

At a recent hearing of the Ohio Public Utilities Commission the case of the Star Telephone Co., Ashland, for increased rates was concluded by the company.

Those present to represent Ashland city and county at the hearing were Mayor B. F. Zercher, Prosecuting Attorney H. E. Culbertson and City Solicitor C. S. Huffman. Those to protest against the the increase were John Weber of Medina and Attorney Dolittle of Wadsworth.

The hearing will be continued April 11, when the protesting side will be heard.

Johnstown, Pa., Protests Increase in Rates for Service.

The city of Johnstown, Pa., losing a court decision to the Johnstown Telephone Co., involving more than $3,000 rental for "free" telephone service under a city franchise, has decided to protest against the increases announced by the telephone company, which were effective April 1.

The city council unanimously passed a resolution declaring the rates excessive and unnecessary and instructed City Solicitor Tillman K. Saylor to prepare a formal complaint to be filed with the state public service commission.

Summary of Commission Rulings and Schedule of Hearings.

INTERSTATE COMMERCE COMMISSION.

March 16: Acquisition by the Mountain States Telephone & Telegraph Co. of the properties of the Cheyenne County Telephone Co., Cheyenne Wells, Colo., found to be of advantage to the persons to whom service is to be rendered and in the public interest. A certificate was issued.

March 18: Acquisition by the Pacific Telephone & Telegraph Co. of the properties of the Turlock Home Telephone & Telegraph Co., Turlock, Cal., found to be of advantage to the persons to whom service is to be rendered and in the public interest. Certificate issued.

ILLINOIS.

February 15: Order approved permanently vacating and setting aside resuspension order affecting rate schedule Ill. C. C. 4 of the Odell Telephone Co. for service in Odell and vicinity; also, permitting company to place in effect the schedules of rates on file with the commission, designated as Ill. C. C. 4, for service in Odell, Livingston county and vicinity, effective March 1, 1927.

February 15: No action taken on application of Wessel & Mann Telephone Co., Loraine, rate 8, schedule Ill. C. C. 1, for service in Lorain, Adams county, effective February 15, 1927.

February 16: Order postponed extending until August 25, 1927, period of suspension of the proposed rates for service in Teutopolis and vicinity, stated in rate schedule Ill. C. C. 1, sheet, of the Teutopolis Telephone Co.

February 16: Order approved suspending until July 7, 1927, proposed rates for service in Teutopolis and vicinity, stated in rate schedules Ill. C. C. 1 and 2, of the Teutopolis Telephone Co.

February 16: Order issued approving so much of agreement, dated September 1, 1926, between The Cleveland, Cincinnati, Chicago & St. Louis Railway Co. and the Illinois Bell Telephone Co. as provides for the construction, maintenance, operation and use of a guy wire and anchor located at Paris.

February 16: Order issued approving intercorporate agreement dated November 30, 1926, between the Illinois Bell Telephone Co. and Milton Colthurst, operating as the Cabery Telephone Exchange covering the connection of toll lines of the companies.

February 16: Order approving intercorporate agreement dated November 5, 1926, between the Illinois Bell Telephone Co. and the Reynolds Independent Telephone Association for the purpose of adding the exchange of the Buffalo Prairie switchboard at Buffalo Prairie, etc.

February 16: Order approving intercorporate agreement dated January 3, 1927, between the Illinois Bell Telephone Co., and the Illinois Southern Telephone Co., Murphysboro, being a modification of a traffic agreement dated March 27, 1926, between these companies.

February 16: No action taken on application of the Inter-County Telephone Co. rate schedule Ill. C. C. 1, toll service in LaPlace, Piatt county, effective March 1, 1927.

February 16: No action taken on application of the Illinois Consolidated Telephone Co. rate schedule Ill. C. C. 2, supplemental sheets 8, applying to toll service at Taylorville and other towns, effective October 1, 1926.

February 17: Applications of the Arthur Mutual Telephone Co. for advances in rates for toll service in Arthur and vicinity, and of the Macon County Telephone Co. for advance in rates for toll service in Dalton City, Mt. Zion and Bethany and vicinity, ordered reopened for further hearing and that they be consolidated with application of the Sullivan Home Telephone Co. for advance in rates for toll service in Sullivan, Moultrie county and vicinity and set down for immediate hearing.

February 24: Order approved dismissing complaint of Cooney & Keefe against the Tampico Farmers Mutual Telephone Co., Tampico, relative to excessive rate for individual line service at Deer Grove, Whiteside county.

February 24: Order approved dismissing complaint of Lamotte Cooperative Telephone Co., Palestine, relative to the Central Illinois Public Service Co.'s construction of a high-tension electric transmission line parallel with telephone lines of complainant on public highway between Palestine and Robinson, Crawford county.

February 24: Order approved authorizing the C. T. & N. Telephone Co. to purchase, and the Casey Telephone Co. and Toledo Telephone Co. to sell their exchanges and physical properties for $86,100 to be paid to the Casey Telephone Co. and for $34,020 to be paid to the Toledo Telephone Co.; also, authorizing the C. T. & N. Telephone Co. to purchase and Harry Delashmutt (doing business as Neoga Telephone Co.) to sell his exchange and property for $22,500; also granting to the C. T. & N. Telephone Co. a certificate of convenience and necessity to own, construct, maintain and operate the exchanges or systems of Casey Telephone Co., Toledo Telephone Co. and Harry Delashmutt; also, authorizing the C. T. & N. Telephone Co. to execute and deliver its first mortgage or deed of trust, dated February 1 1927, to A. H. Lindsay, of Casey, as trustee; and authorizing the C. T. & N. company to issue so as to net not less than the par amount thereof ,and to sell so as to net not less than 90 per cent of their face amount, $60,000 aggregate par amount of its common capital stock, $40,000 aggregate par amount of its 6 per cent cumulative preferred capital stock, and $60,000 aggregate principal amount of its first mortgage gold bonds, Series "A," dated February 1, 1927, maturing February 1, 1942, the bonds to be issued under and secured by first mortgage or deed of trust authorized.

March 9: Order approved cancelling and annulling suspension and resuspension

There Can Be No Better Recommendation

THE vast telephone systems, widespread across the country are practically Weston equipped. The great investment in the telephone field demands the most dependable equipment at reasonable cost with commensurate long-life and low maintenance. This is why the telephone field uses Westons. ¶ For the smaller Central Offices Weston offers its medium priced instrument especially adaptable for the type of service—Model 24 Wire Chief's Voltmeter with a diameter of $7\frac{1}{4}$ inches. ¶ Precise, dependable, with a guaranteed accuracy of one per cent of full scale value. ¶ For full information on Weston instruments available for this result-demanding field, address—

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Principles and Practice of Telephony

These five books place thousands of practical facts at your command for instant use.

Beginning with a comprehensive survey of the basic principles involved, the author discusses such subjects as telephone apparatus, circuit elements and analysis, typical cord combinations, telephone power plant equipment, coil winding, the toll switchboard and toll equipment in the multiple office.

You learn about toll trunking, the nature and laws of telephone traffic, machine and automatic ringing, call distribution, trunk mechanical switching, mechanical-manual switching, etc.

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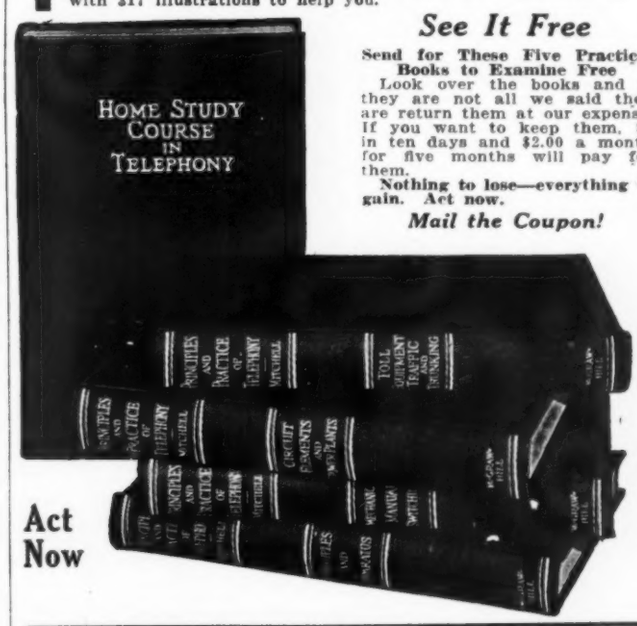
To earn an expert's pay, you know that an expert's knowledge is necessary. With these books you get the combined experience of many telephone experts—down in black and white, with 317 illustrations to help you.



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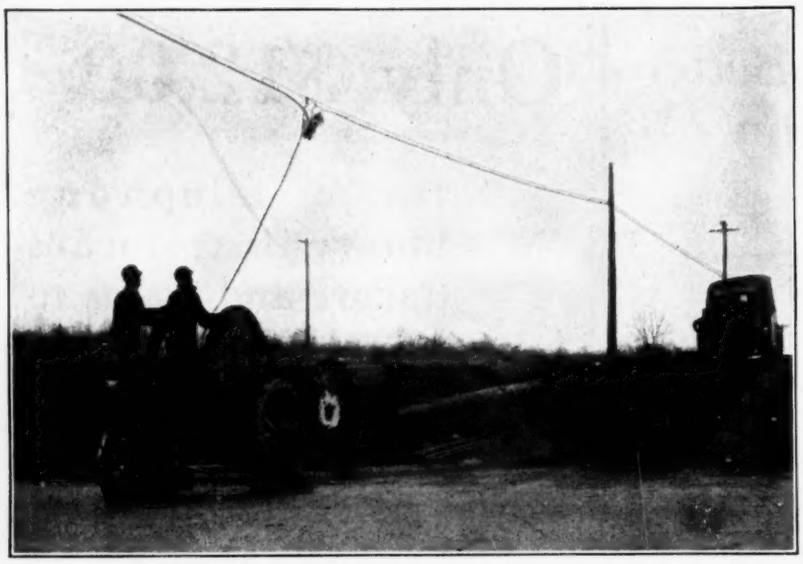

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order affecting rate schedule Ill. C. C. 3 of the Depue Telephone Co., Depue, applying to service in Depue and vicinity, and authorizing the company to place the schedule in effect April 1, 1927.

March 9: Order approved granting to the Cape Girardeau Bell Telephone Co., Cape Girardeau, Mo., a certificate of convenience and necessity to construct, operate and maintain lines and facilities in territory in Alexander county, and to render service in and about this territory.

March 9: Order directing that on and after April 1, the Northwestern Illinois Utilities and the Lanark Mutual Telephone Co., Lanark, shall make monthly settlement each with the other for traffic sent over the jointly-owned Lanark-Mt. Carroll line, using as a basis for such settlement a station-to-station charge of 10 cents, and a person-to-person charge of 15 cents per message, as set forth in the order.

March 9: Order approved vacating and setting aside commission's order of February 16, suspending rate schedule Ill. C. C. 1, of the Corn Belt Telephone Co., McLean, applying to service in Downs, McLean county, and vicinity.

March 9: Order issued approving intercorporate agreement, dated November 1, 1926, between the Illinois Bell Telephone Co. and the Central Illinois Independent Telephone Co., Carlinville, approved.

INDIANA.

March 15: Order issued increasing the gross annual income of the Butler Telephone Co., Butler, approximately $2,000 through a revision of the rate schedule.

NEBRASKA.

March 24: In the matter of the application of the Union Telephone Co. of Wausa for rates for special services; ordered that company be authorized to make a rate of 25 cents extra for desk sets and a rate of 50 cents a month as a vacation tariff when owners do not occupy premises.

March 24: Application of the Citizens Telephone Co., of Paxton, for authority to build rural lines into territory occupied by the Sutherland Telephone Co., denied.

March 24: In the matter of the application of the Citizens Telephone Co. of Paxton, for an order permitting it to discontinue free service to subscribers on a rural line of the Sutherland Telephone Co., switched by it; ordered that the request be granted, with the alternative to the Sutherland company of paying the ordinary rate of 60 cents a month for each subscriber on the switched line.

March 29: Hearing before the commission on the application of the Garfield County Mutual Telephone Co. for permission to increase rates.

OHIO.

March 15: Schedule filed by the Cincinnati & Suburban Telephone Co., rejected because it had not been filed 30 days prior to the effective date of the rate sought. Schedule established a 50-cent minimum charge for the new European type hand telephone.

April 11: Hearing on proposed increase of rates of Star Telephone Co., Ashland, continued from March 18.

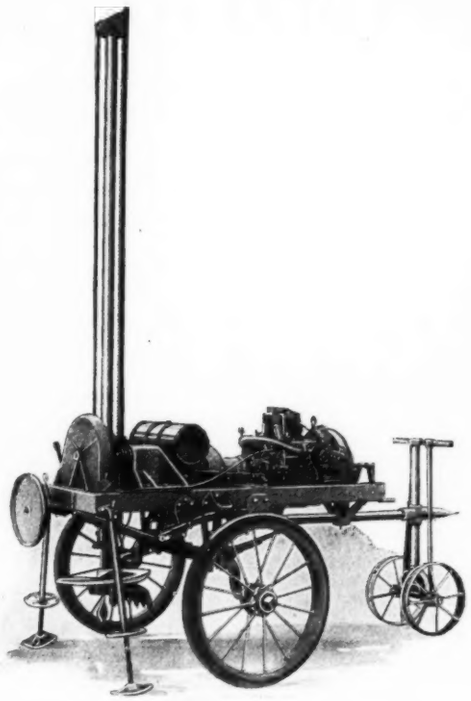
OKLAHOMA.

March 25: Hearing of case of the Watonga Telephone Co., Watonga, against H. M. Krebs and Oakwood Telephone Co., asking for discontinuance of telephone line.

VIRGINIA.

March 12: Application filed by Chesapeake & Potomac Telephone Co. asking for amendment of certain existing toll schedules. Three changes would either reduce rates or increase service by the company, while the fourth would raise the present rate. The changes became effective April 1, if no opposition developed.

To say: "I saw it in TELEPHONY" identifies you.



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If time is money, can you afford to be without a Buda-Hubron earth drill?

Estimate the time required for drilling holes by hand — including time lost while the gang is waiting for the hole to be dug. Compare this with the time of the efficient Buda-Hubron drill which digs a pole hole six feet deep in three minutes. There is one possible conclusion—shovel and spoon methods are too expensive.

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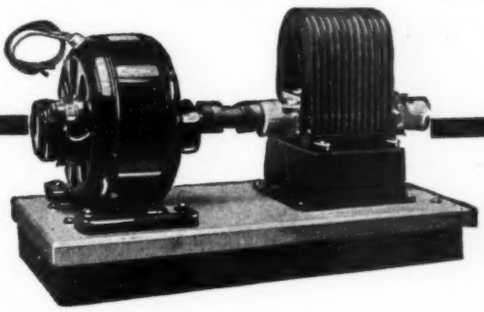

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Must be maintained in your exchange.

The Holtzer-Cabot Magneto Ringing Motor Generator is recognized as the STANDARD by experienced telephone men. Once installed, your ringing troubles are over and subscribers are assured of perfect ringing service.

No attention is required; occasional lubrication is all that is needed.

Give this unit a thorough test in your exchange. We stand back of all our products.

The Holtzer-Cabot Electric Co.

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With the Manufacturers and Jobbers

American Electric Co., Inc., Develops New P. B. X. Switchboards.

Private branch exchange switching has always presented many problems for the telephone company. Engineering opinion differs as to what kind of circuit and trunk operation has offered the best results and as a consequence there has been a wide variance in the design of P. B. X. switchboards.

American Electric Co., Inc., has just recently completed the development of two new-type Monarch P. B. X. switchboards that are standardized as to equipment, design and operation and should meet the requirements of the most exacting telephone company. This standardization of boards is developed to such a degree that they can be operated with either common battery manual or automatic service.

These boards are grouped into two classes: One is known as the standard P. B. X. switchboard; the other as the feature P. B. X. switchboard.

The feature P. B. X. switchboard contains all of the features of the standard switchboard as well as many others that provide special operating and trunk requirements desired by some operating companies.

Both the standard and feature P. B. X. switchboards will be built in two sizes—30-line and 80-line. Each size will be carried in stock by the American Electric Co., Inc., in three capacities, and can be operated with or without dial, according to the type of city equipment.

Larger boards of any capacity desired can be furnished having the same features and requirements as these standardized smaller P. B. X. switchboards. Standardization of P. B. X. switchboards of both the equipment and traffic standpoint is obtained with these switchboards. The various operating features of these two boards are interchangeable according to the requirements of the different types of exchanges, but the mechanical construction is common to both.

The following are some of the principle features of the standard feature P. B. X. switchboards:

The station and exchange trunk circuits are terminated on answering jacks, with which are associated the corresponding lamp signals.

Double-ended connecting cords are provided for setting up connections. Through relay control, these cord circuits adapt themselves to either station-to-station, station-to-trunk or trunk-to-station service.

Lamp supervision is provided in the cord circuits.

Talking battery is supplied from the P. B. X. battery source except, when the through calling or night service key is thrown, the battery for the P. B. X. station is furnished from the exchange trunk source.

When the through dialing key is operated, the cord circuit is set for the following classes of special services: (a) Through dialing; (b) long distance connections (optional operation); (c) night connections.

Placing of all calls is under the supervision of the P. B. X. operator, while the through calling key is thrown.

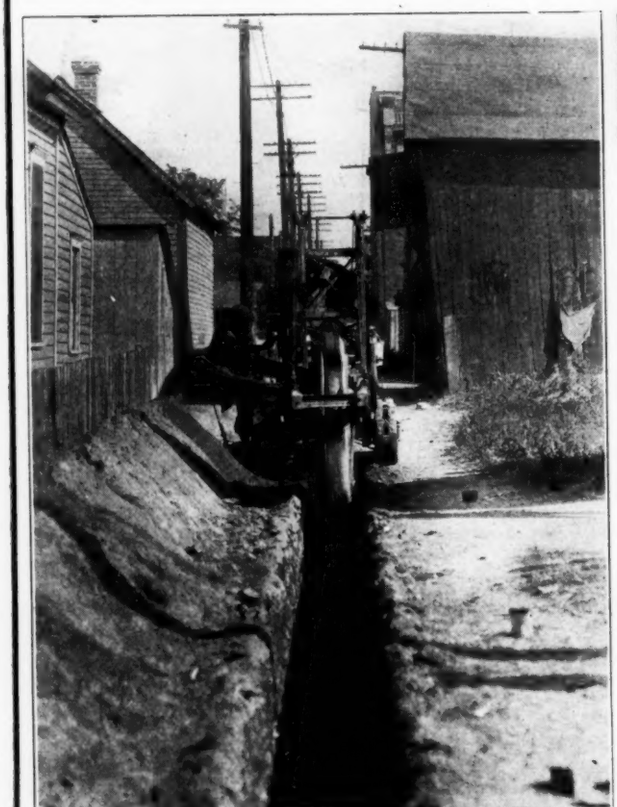
All feature boards are provided with trunk recall.

Non-ring through supervision can be arranged for with the feature P. B. X. switchboards if desired.

For night service no extra patching cords or special night jacks are required.

Special night group jacks are provided for use when several stations are to be connected to a single trunk for night service.

Great care has been taken to prevent



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THE BABY DIGGER
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Spend 20% and Save 80%

With a Baby Digger you will save 80% over your present costs of trenching by hand.

This statement is based on actual cost records kept by telephone companies now using the Baby Digger.

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unnecessary operation of relays, and the windings are designed to give maximum efficiency with minimum current drain.

Full information regarding the operation and design of these boards may be obtained from the American Electric Co., Inc., Chicago.

Paragraphs.

At the annual meeting of the board of directors of the W. N. Matthews Corp., St. Louis, Mo., the following officers were elected for the fiscal year ending March 2, 1928:

W. N. Matthews, president; Claude L. Matthews, vice-president and treasurer; and M. C. Cooley, secretary.

THE GENERAL INSULATE CO., INC., has been acquired by the Insulation Mfg. Co., Inc. (electrose products) of 70 Washington street, Brooklyn, N. Y., and will be continued as a department of the new owners under the name General Insulate Co., Inc.

The combined organization covers an experience of over 25 years in insulation and moulded products specialties, as well as an especially equipped machine shop, with experts for the making of the most complicated and difficult dies and moulds.

Monarch 80-Line P. B. X. Switchboard of Either the Standard or Feature Type. May Be Equipped with Dial.

The Stromberg-Carlson Company's New Catalog.

The Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y., recently issued a new catalog of telephones, switchboards, radio apparatus, and supplies, as referred to in TELEPHONY of March 19.

The catalog is fully illustrated and contains descriptions of the various Stromberg-Carlson products and the materials and supplies which it handles. This cloth-bound book of 260 pages, 10¾ ins. by 7½ ins. in size, should be in every Independent telephone exchange.

Personal.

L. A. PAGE, JR., has recently been appointed as a member of the sales staff of the New York office of the Page & Hill Co.

Mr. Page was formerly connected with the Dayton office and, prior to that, with the producing department of the Page & Hill Co.

Prices in the Metal Markets.

New York, March 28—Copper—Steady; electrolytic, spot, 13.25c; futures, 13.25c. Tin—Easy; spot and nearby, $68.00; May, $66.75. Iron—Steady; No. 2 f.o.b. Eastern Pennsylvania, $21@21.50; No. 2 f.o.b. Buffalo, $17.50@18; No. 2 f.o.b. Alabama, $18. Lead—Steady; spot, 7.45c. Zinc—Easy; East St. Louis spot and futures, 6.60. Antimony—Spot, 13.50@13.75c.

Condensed Telephone News

Companies Are Urgently Requested to Forward to Us Promptly News Concerning Construction, Rebuilding, Financing, Election of Officers, Sales and Purchases of Exchanges or Other Activities

Incorporations and New Telephone Companies.

BOONEVILLE, KY.—The Owsley Telephone Co., Booneville, has been incorporated with a capital stock of $10,000. The incorporators are: A. J. Creech, R. C. Long and D. W. Barrett.

BOYD, ORE.—The Boyd Telephone Co. has been incorporated with a capital of $1,000, to engage in owning and operating telephone lines, equipment, etc. The incorporators are A. A. Marvel, C. H. Southern, and Elwood Adkinson.

DEL RIO, TEX.—The Laredo Southeastern Telephone Co. has been incorporated with a capital stock of $150,000. The incorporators are R. W. Prosser, L. Rust and J. A. Forman.

Construction.

MAJENICA, IND. (P. O. Huntington)—Work has started on rebuilding the exchange of the Majenica Telephone Co., which was recently destroyed by fire. This company provides the Markle community with telephone service. The switchboard was removed during the fire, and was placed in an adjoining building temporarily.

SEDRO-WOOLLEY, WASH.—The Puget Sound Telephone Co., of Everett, will build a new exchange here this summer on its site on Ferry street, at a cost of from $15,000 to $20,000. The company planned to erect the building this spring, but a delay in preparing plans necessitated the postponement of the work for a few months.

Elections.

ROCKFIELD, IND.—At the recent annual meeting of the Rockfield Cooperative Telephone Co. these officers were elected: President, Gilbert Million; vice-president, Will Snoeberger; secretary and treasurer, P. M. Byrum.

BUSSEY, IOWA—The annual meeting of the Bussey Telephone Co. was held recently. J. A. Moore was elected as the president to succeed himself. W. H. Lowman, secretary and treasurer, and Charlie Elliott, director, the only old member of the board to hold over. Len Visser and Tom Haywood were elected as new members of the board.

WOODHULL, ILL.—At the annual meeting

PATENTED ARRANGEMENT FOR DISLODGEING COIL WITHOUT TEARING DOWN FURNACE
PATENTED SEAMLESS TUBING COIL GENERATOR
IMPROVED ONE PIECE BURNER
HAND HOLD FOR CLEANER ONE TURN CLEANS ORIFICE
AUTOMATIC ORIFICE CLEANER
AUTOMATIC PUMP INSIDE TANK
16 GUAGE STEEL TANK WELDED BOTTOM

UNIQUE

Stands Supreme On Record of Service

Linemen throughout the nation have tried Unique furnaces—will now use no other.

They represent the supreme achievement in furnace manufacture.

The automatic orifice cleaner and many other improved features that have capably met the most severe tests of line maintenance work will fulfill your requirements.

Write today!

UNIQUE MFG. CO.
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They're Making A BIG HIT:

The new improved

"Always Reliable" Gasoline Furnaces

No. 20 pump furnace.
Covered by patents.
New patents pending.

No. 19—with bulb and 6½" regular shield.
No. 20—with pump and 6½" regular shield.
No. 21—with pump and combination shield.
No. 22—with pump and 9¼" shield.

Ask for circular describing the improvements.

Your men should use them to get the most satisfactory results.

Most jobbers stock this line. Others will gladly order.

OTTO BERNZ CO. INC., Newark, N. J.

Stocks in Newark, N. J., New York City, Chicago and San Francisco

Offices in Newark, N. J., New York City, Chicago, Fort Worth, Denver, Helena, Mont., San Francisco, Los Angeles, Seattle, and St. Thomas, Ont.

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Exclusive Telephone Accountants

J. G. WRAY & CO.
Telephone Engineers
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization, and Operation of Telephone Companies.
J. G. Wray, Fellow A. I. E. E.
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of the stockholders of the Woodhull Village Telephone Co., the directors organized for the ensuing year with these officers: President, S. H. Whitcomb; vice-president, Benjamin Downs; secretary, Geo. E. Swanson; treasurer and collector, F. J. Wendt, and trouble man, F. J. Wendt.

A dividend of $5 per share was declared. This makes a dividend total of $29.50 per share since the present management took charge.

ALLEGAN, MICH.—The Western Allegan County Telephone Co. has elected officers for the ensuing year as follows: President, Geo. Leland; vice-president, Fred Wade; treasurer, Leon Shepard; secretary-manager, C. W. Bowles. Directors were elected as follows: George Leland, Fred Wade, M. C. Hutchinson, Leon Shepard and C. W. Bowles.

Miscellaneous.

SABULA, IOWA—Purchase of the business and equipment of the Sabula Telephone Co. by the Central Cities Telephone Co. of Chicago has been announced. The purchase was negotiated by S. H. Winston, president of the Central Cities company, and the final details were closed when R. R. Goodrich, secretary of the company, visited Sabula. The transfer is retroactive to February 1, 1927.

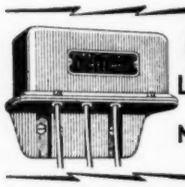
Among the companies the Central Cities Telephone Co. have already taken over in this section of Iowa are DeWitt, Low Moor, Charlotte, Oxford Junction, Lost Nation and Lowden. Henry Sieffert, of DeWitt, will act as district manager.

BROWN CITY, MICH.—J. B. Hagaman, who has owned the Brown City Telephone Exchange since 1919, has sold it to a Chicago firm. Albert Hall of Milford has taken charge of the work. He promises many improvements and new equipment.

WILLIAMSPORT, PA.—The merger of the Williamsport & North Branch Telephone Co. with the Montour & Columbia Telephone Co., People's Ideal Telephone Co. and Roaring Creek Valley Telephone Co. was approved at a recent meeting of the stockholders.

KELSO, WASH.—The Rocky Ridge Telephone Co. has received a franchise to establish a line for a distance of four miles along the new Cloverdale road from Kalama to Rocky Ridge from the county commissioners on petition of Andrew Lindula, Abe Pakkala and John Hendrickson.

WINLOCK, WASH.—A temporary franchise has been granted by the city council to the Cowlitz Prairie Telephone Association to construct and maintain a line in Winlock. Granting of a permanent franchise will be determined May 25 at a public hearing by the Washington Department of Public Works.



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